BROWNFIELD SOLUTIONS LTD

GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

FI CONSTRUCTION

The Oaks, Wrexham

Remediation Strategy

CC/C6668/15605

May 2026

EXECUTIVE SUMMARY OF REMEDIATION PROPOSALS

Remediation Requirements	Verification Requirements
Excavation, screening and engineering / re-use of soils to an appropriate specification. MMP in place for material re-use/importation.	Materials imported or destined for re-use to meet chemical criteria as per Appendix A. Material tracking and transfer/delivery notes/tickets recording volumes.
Installation of ground gas protection measures is required (radon resistant membrane). The above is subject to agreement with the local authority, and requirements should be confirmed at the earliest opportunity.	Verification of the installation of radon protection measures to CIRIA C735 and BRE211 including inspection sheet, photographic evidence, installer certificates etc. Gas protection systems validated by competent professionals.
On completion of the above follow final verification reporting requirements.	Final verification and reporting to include (but not limited to): • Any sampling locations and test results. • Any the material imported to the site (including volume, source and chemical composition). • All material exported from the site (including volume, destination and chemical composition). • Gas protection measures verification records.

This executive summary should be read in conjunction with the full report, reference CC/C6668/15605,and not as a standalone document. Document Version 2.4.

PROJECT QUALITY CONTROL DATA SHEET

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Issued By:	**Client:**
Brownfield Solutions Ltd William Smith House 173 – 183 Witton Street Northwich Cheshire CW9 5LP Tel: 01606 334 844 brownfield-solutions.com	FI Construction Canal Mill Botany Brow Chorley Lancashire PR6 9AF
	Contact: Dean Trainor

[redacted]

C Ching
MSc (Geol) FGS
Geotechnical Consultant

C Ching

Checked by:

[redacted]

A J Stokoe
BSc (Hons) CSci MIEnvSc FGS
Managing Director

CSci Chartered Scientist

Approved by:

[redacted]

A J Stokoe
BSc (Hons) CSci MIEnvSc FGS
Managing Director

CSci Chartered Scientist

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DRAWINGS		
Drawing Number	**Rev**	**Title**
1256-MCAU-T.02-00-001	T9	Proposed Site Plan
RCFP01	-	Regrade Cut/Fill Plan
C6668/01	-	Site Location Plan
C6668/02	-	Exploratory Hole Location Plan
C6668/03	-	Conceptual Site Model

APPENDICIES	
Appendix	**Title**
Appendix A	Chemical Specification for Soils
Appendix B	BSL Guidance -Re-use of Waste and Disposal
Appendix C	Radon Protection System Details
Appendix D	Non-Specialist Matching Brief Guidance

1.0 INTRODUCTION

1.1 Context

This Remediation Strategy has been produced by Brownfield Solutions Limited (BSL) for FI Construction on a site off Oak Road, Wrexham and has been completed in general accordance with the following guidance:

- Environment Agency guidance - Land Contamination: Risk Management (LCRM).
- BS 10175:2026 Investigation of Potentially Contaminated Sites.

1.2 Background and Scope

This Remediation Strategy is to set out how the remediation of the site will be undertaken and how the works will be validated. The document explains how the works will be permitted under current regulatory regimes and has been produced to support discharge of Conditions 9 and 12 of the granted planning permission reference P/2025/0430. Conditions 10-12 shall also be fully addressed under separate cover following remediation on site during construction, and the production of a Verification Report.

The scope of work for this document comprises a summary of the ground model, summaries of the of risk assessments carried out, a Remediation options appraisal (LCRM Stage 2), Remediation Strategy (LCRM stage 3) implementation details and any validation requirements.

Note that geotechnical aspects are not specifically addressed within this document as it seeks to meet the requirements set out within LCRM. Geotechnical aspects should be considered within a Geotechnical Design Report in accordance with Eurocode 7 or a suitable site specific Earthworks Strategy.

1.3 Proposed Development

The proposed development will comprise an approximately 80,000 sq.ft Hiab warehouse/office/distribution unit, with associated hardstanding car parking, infrastructure and soft landscaped areas as per MCAU drawing reference 1256-MCAU T.02-00-001-T7 dated September 2025. The wider area will be retained as managed woodland/soft landscaped areas.

1.4 Available Information

Relevant reports and documents pertaining to the site are given below:

- Phase I Geo-Environmental Assessment Report was issued by SP Associates, reference S1916, dated March 2024.
- Phase II Geo-Environmental Assessment Report was issued by SP Associates, reference S1916-2, dated September 2025.
- Planning correspondence was issued by Natural Resources Wales (NRW), reference CAS-288516-J8L2, dated 9th January 2026.
- BGS Radon Report was purchased by BSL (reference BGS_348020/67330), dated 15th April 2026.
- Wrexham County Borough Council planning permission (reference P/2025/0430) granted on 8th May 2026.
- BSL Ground Investigation Report reference CC/C6668/15518 Rev B dated 21st May 2026.

It is assumed that the Local Planning Authority will have provided the above reports to the appropriate statutory consultees and the recommendations therein have been accepted.

1.5 Limitations

This report has been prepared for the sole use and reliance of the Client, FI Construction. This report shall not be relied upon or transferred to any other parties without the express written authorisation of BSL. If an unauthorised third party comes into possession of this report they rely on it at their risk and the authors owe them no duty of care or skill.

Current UK guidance and legislation has been used in the environmental assessment of the site, BSL is not liable for any subsequent changes in the guidance and legislation.

BSL have used reasonable skill, care and diligence in the production of this report. The findings and opinions conveyed via this report are based on information obtained from a number of sources as detailed within this report, BSL have assumed this information is correct and reliable. Nevertheless, BSL cannot and does not guarantee the authenticity or reliability of the information it has relied upon. This report may not be relied upon by the client or submitted to a third party for their reliance for the purposes of valuation, mortgage, insurance and regulatory approval, until all invoices have been settled in full.

The recommendations within this report are based upon the proposed site end use provided to BSL at the time of writing. If the end use or development layout changes from the proposal, then the recommendations may change or become invalid.

The site plans enclosed in this report should not be scaled off. Any site boundary line depicted on plans does not imply legal ownership of land.

Any recommendations made in this report should be confirmed with the Regulatory Authorities prior to implementation to ensure compliance.

2.0 GROUND MODEL SUMMARY

2.1 Description of Site

The site is located off Oak Road, Wrexham, LL13 9RG, centred on National Grid Reference 338615, 349350, as shown on the Site Location Plan, Drawing No. C6668/01.

The main site features and potential issues identified during the time of the intrusive investigation in April 2026 are detailed below.

Feature	Description
Site Area	Approximately 4 hectares of proposed development area within the tenant boundary, however the site comprises 17 hectares overall within FI ownership. The site is defined based on the tenant boundary and proposed development area.
Site Access	Access is gained off Oak Road to the north of the site.
Current Land Use and Site Features Potential Sources of Gross Contamination	The site is mostly bare ground comprising recently deforested scrubland and woodland, however the southern extents of the site near Redwither Brook consist of woodland and grassed areas. A medium-sized brick building is present slightly beyond the northeast of the site and the proposed development area. Two sets of overhead powerlines cross the site, a 132 kV overhead service passing through the eastern boundary of the site and proposed development area, and a 33 kV overhead service passing through the western boundary of the site and proposed development area. A manhole cover was identified adjacent to Redwither Brook to the south of the site, denoting possible drainage/sewers. A concrete road provides access into the northern extent of the site, however most of the site is accessed using trackways.
	No obvious signs of potential contamination were identified during the site walkover.
Vegetation / Ecology	There are sporadic mature/semi-mature trees across the majority of the site. There is also woodland comprising abundant mature and semi-mature trees near Redwither Brook at the southern extents of the site.
Topography	The site generally comprised flat and undulating ground, varying in elevation but gradually increasing from 25.5m AOD in the south of the site to 28.5m AOD in the north of the site (approximately 3m difference). However, an embankment was present along the southwestern boundary of the site sloping down to an area of flat land adjacent to Redwither Brook at a substantially lower elevation of 22.50m AOD (approximately 3-6m below the majority of the site).
Site Boundaries	Oak Road borders the site to the north and Redwither Brook borders the site to the south. The remaining site boundaries are not defined by discernible features, except for an industrial warehouse that forms the western site boundary.
Surrounding Area	The site lies to the south of Wrexham Industrial Estate and Redwither Business Park. Industrial buildings are present to the north and west, and agricultural fields to the south and east. Immediately north of the site beyond Oak Road is an electricity substation.
Site Area	Approximately 4 hectares of proposed development area within the tenant boundary, however the site comprises 17 hectares overall within FI ownership. The site is defined based on the tenant boundary and proposed development area.
Site Access	Access is gained off Oak Road to the north of the site.

2.2 Environmental Setting

Site History

The site was agricultural land until the early 1940s. During World War Two the site was developed as part of Royal Ordnance Factory (ROF) Wrexham, used primarily to manufacture cordite for explosives and subsequently as an ammunition dump. Post-war, bunkers and structures were removed and likely infilled with imported material. Since the early 1980s, the site has remained as undeveloped woodland and scrub, of which vegetation clearance was undertaken in the early part of 2026 to facilitate further investigation.

The surrounding area had a similar history, remaining undeveloped until establishment of ROF Wrexham in World War Two and post-war has included expansion of Wrexham Industrial Estate.

Published Geology

From the SP Associates Phase 1 Assessment (reference S1916 issued March 2024) and published geology, it was anticipated that ground conditions would comprise the following sequence of strata (top down):

- Made Ground; over
- Glacial Diamicton (Till), with Alluvium near the brook in the south, over
- Kinnerton Sandstone Formation.

Hydrogeology

Based on the inferred geology, a summary of the Environment Agency aquifer designations is presented in the table below:

Stratum	Coverage	Aquifer Designation
Glacial Diamicton	Full Site, except southern area	Secondary Aquifer (Undifferentiated). The classification is assigned where it is not possible to attribute either category A or B to the aquifer.
Alluvium	South	Secondary (A) Aquifer. These are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.
Kinnerton Sandstone Formation	Full Site	Principal Aquifer. This is Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale.

The site was located within Source Protection Zones 2 and 3. There were three licensed groundwater abstractions within 250m of the site, likely from the deeper Principal Aquifer, which is considered to be protected from a significant thickness of low permeability glacial Till, at least >16.00-18.00m thick.

Hydrology

The nearest watercourse was Redwither Brook, approximately 10m south west of the site (phase I stated 50m).

Potential Environmental Constraints

No registered landfills or waste transfer stations within 250m of the site. However, there were several licensed waste management and treatment facilities present within 250 m, reflecting the industrial nature of the area.

Radon

Due to the recommendations previously outlined in the SP Associates Phase I and Phase II reports, a BGS Radon Report for the site was subsequently obtained by BSL. The BGS Radon Report (reference BGS_348020/67330 issued 15 April 2026) stated the property is in a radon affected area where 5-10% of properties are estimated to be at or above the action level.

Given the above, basic radon protective measures are therefore required.

UXO Risk
The site was formerly in military use as ROF Wrexham. A Preliminary Unexploded Ordnance (UXO) Threat Assessment commissioned by SP Associates and conducted by Alpha Associates project reference 11125 dated 21st March 2024 indicates a high risk from UXO and recommends a detailed desk study is commissioned before intrusive ground works.

2.3 Ground Conditions

Observed Geology and Groundwater
From the investigations carried out, the ground conditions can be summarised as below (top down):

- Made ground generally comprising clay with varying proportions of sand and gravel from ground level to between 0.20m and 1.50m bgl.
- Natural superficial deposits mostly comprising firm to hard clay (Glacial Till) proven to depths of at least 4.45m bgl. Natural deposits consisting of interbedded saturated very loose or very soft sand, silt, and clay (Alluvium) were proven to depths of between 2.40m and 2.70m bgl to the southwest of the proposed development adjacent to Redwither Brook.
- Solid geology was not encountered in the 2025 or 2026 ground investigations. A BGS borehole conducted in the northern part of the site encountered clay soils to 18.00m depth. Other nearby BGS boreholes varied, with one having encountered clay soils to 45.00m depth, and another having encountered mudstone from 16.50m depth.
- No groundwater was identified across the majority of the site. Groundwater levels ranging between 1.20m and 3.20m bgl were identified during site works at lower elevation adjacent to Redwither Brook.

Infilled former bunkers and structures were historically removed and likely infilled with imported material, however the exact location(s) across the site are unknown and may be encountered during groundworks.

Observations
With the exception of charcoal and burnt shale observed as a minor constituent in the made ground soils, no other evidence of contamination was observed at the site.

UXO
No known potential UXO was observed by BSL during 2026 ground investigation works.

3.0 SUMMARY OF RISK ASSESSMENTS

3.1 General

The previous site investigation has confirmed the following:

- There was no significant visual or olfactory evidence of contamination at the site.
- Within the soils tested, there are no exceedances above commercial screening criteria within the made ground and natural soils on site.
- Permanent ground gases are not considered to be low risk.
- The site lies in a radon affected area and basic protection measures are required within proposed structures.

UXO requires further assessment, but this is considered to be a CDM H&S requirement and not related to chronic human health risks as addressed by the Phase II assessmnets an this Remediation Strategy.

3.2 Human Health Risks

A geo-environmental assessment was previously undertaken by SP Associates following their 2025 ground investigation, including testing for asbestos, phenols, heavy metals, inorganic chemicals, speciated petroleum hydrocarbons, PAHs, and BTEX. The assessment compared the chemical data to Tier 1 chemical screening criteria for industrial/commercial end use and found that none of the above tested determinands that exceeded their Tier 1 screening values.

BSL conducted further soils analysis in April and May 2026 across previously inaccessible areas of the site in the south for a broad suite of metals, PAHs, PCBs, asbestos, petroleum hydrocarbons and explosive screens. No exceedances of the generic Tier 1 screening criteria for a commercial end use were adopted.

Following the above and in full consideration of the CSM, the risk to human health from contaminants within onsite shallow soils was considered to be low and no further action is required in respect to human health risks from soils contamination, based on the intended end use.

It was also considered unlikely that the site is being affected by offsite contamination sources as the majority of the site is underlain by clay strata and therefore contamination is unlikely migrate onto the site.

3.3 Permanent Ground Gases, Vapours & Radon

The gas risk assessment undertaken by SP Associates following their 2025 ground investigation revealed carbon dioxide measured within boreholes had a maximum concentration of 1.6%, while methane was effectively absent. A resulting gas screening value (GSV) of 0.0016 l/hr was calculated for carbon dioxide. In accordance with Ciria C665 guidance, the GSV placed the site into a Characteristic Situation 1 (CS1) classification which classified the site as very low risk with respect to methane and carbon dioxide and no further action is required.

As part of the BSL investigation, following a review of the encountered ground conditions across the south of the site and in consideration of the CSM, it was concurred the risk is low.

No contaminants were identified that would indicate a vapour intrusion risk and no further action is required.

The BGS Radon report indicates that property is in a radon affected area where 5-10% of properties are estimated to be at or above the action level, and that basic radon protective measures are required for the proposed development in accordance with BRE 211.

3.4 Risk to Controlled Waters

The site is not considered to pose a significant risk to controlled water for the following reasons extracted from the Phase II assessment for clarity:

- Whilst the nearest groundwater abstraction is 160m southwest of the site, likely abstracting from the Principal Aquifer, no significant gross or mobile contamination has been identified on site in soils based on the results obtained as a potential indicator of groundwater contamination.
- There is no indication under present conditions of significant pollution of controlled waters and conditions following development of the site will not be any worse, indeed they may improve with increased hard cover and water retaining imported soft landscaping soils.
- There is unlikely to be any significant input of new contamination at the site in future, and the nature of the proposed development is considered to be low risk.
- The nearest watercourse is Redwither Brook approximately 10m southwest of the proposed development and 90m southwest of the proposed building platform, which provides some distance for attenuation and contaminant degradation from possible minor leachate generation from the made ground.
- The majority of the site is underlain by low permeability clays which will inhibit lateral and vertical contaminant migration.
- A BGS borehole situated in the north of the site indicates at least 18.00m thickness of low permeability cohesive deposits which as stated above will inhibit lateral and vertical contaminant migration.
- For the made ground, the preparation of samples for leachability analysis has not been undertaken as this is an aggressive methodology and provides theoretical values which are unlikely to be representative of existing site conditions, real site leaching concentrations will be reduced significantly from that indicated by the laboratory testing, furthermore this would not be representative of post construction conditions, which will significantly reduce infiltration.
- The concentrations of leachable substances that could emanate from the site will be subject to dilution and dispersal during transport and so the risks will reduce with distance from the site and into the identified surrounding water bodies.
- The findings of this investigation concur with prior investigation and the assessment of a low risk to controlled waters by an independent consultant.
- Additionally, sampling of perched water has not been carried out as:
  - No significant groundwater body has been encountered with the glacial Till which underlies the majority of the site; boreholes were dry.
  - There is no perceived risk to the underlying sensitive Principal Aquifer due to the geology; perched waters within the superficial aquifer are highly unlikely to be in hydraulic continuity with the underlying bedrock.
  - Given the very low to negligible permeability nature of the superficial deposits as proven by infiltration testing, and interbedded nature of thin granular lenses in limited alluvium in the south, such bands are unlikely to provide any significant volume of groundwater to other features via baseflow.
  - Given the above factors, there would be little merit or benefit from sampling and testing the likely highly limited quantities of perched groundwater. Even if there were exceedances of EQS values within such waters, it would likely be extremely challenging, disproportionally costly and unsustainable to remediate these within discontinuous perched water groundwaters to pre-input stages, especially in light of potential diffuse pollution from wider area sources.
  - Based on the infiltration testing carried, drainage to soakaways will not be feasible at the site, further reducing the risk of potential leachate generation, thus making any chemical testing of such strata of little worth.
  - The proposed foundation solution for structures will likely be mass trench fill concrete. This option will not create any new pathways, as these methods are unlikely to advance deeper than 2-3 into the very stiff clays; there would still be a significant thickness of very low to negligible permeability clay

between the base of foundations and the Principal Aquifer. In addition, as stated above, there will be increased hard cover and improved drainage which would reduce the propensity for leachate generation in any case.

- Good site practice and modern construction techniques and equipment mean the risk of spillages from construction plant is unlikely and this temporary potential source is considered to have a low risk to controlled waters.

Based on the above, the site is not considered to pose an unacceptable risk to controlled waters. Therefore, no specific remedial requirements for controlled waters are necessary.

3.5 Summary

A summary of the findings of the previous investigations and assessments where a risk is present (i.e. an unacceptable source-pathway-receptor linkage) which requires mitigation is presented in the table below.

Source	Receptor
<- Poses an unacceptable risk to ->	
Natural Geology - Radon	Human Health – long term inhalation

Based on the above, it was recommended that a Remediation Strategy was prepared that identifies the specific remediation requirements for the site.

4.0 REMEDIAL OPTIONS APPRAISAL

4.1 Remediation Options

This section has been produced in general accordance with the requirements of LCRM: Stage 2 Options Appraisal.

The Investigations and risk assessment have concluded that the site will require remediation is the action required to prevent, minimise, remedy or mitigate the effects of the identified unacceptable risks listed in the section above.

The remediation of the site will need to ensure that upon completion of the development, the ground conditions at the site can be shown to be appropriate for the intended use and that they will not pose unacceptable contamination risks to the identified receptors.

For the options appraisal, there are 3 steps to follow:

1) Identify feasible remediation options.
2) Do a detailed evaluation of options.
3) Select the final remediation option.

The objectives of the remediation will be to sever one or more of the linkages within the source-pathway-receptor (S-P-R) model. There are three broad approaches which can be adopted:

- Remove or treat the source of pollutants.
- Remove or modify the migration pathway.
- Remove or modify the behaviour of the receptor.

The options appraisal process considers the available remedial techniques to achieve the above based on following key criteria:

- Effectiveness.
- Practicality.
- Durability.
- Relative Cost.
- Relative Operational Time (in terms of installation or the activity).
- Sustainability.

The feasibility of each of the listed remedial option is assessed in terms of effectiveness at treating the contamination, which is broken down into; effective (Yes), partially effective (Partially) or not effective (No).

The listed techniques are also assessed in terms of relative cost ranging from negligible cost (£) through moderately expensive (££) to prohibitively expensive (£££).

Timescales over which the remediation technique is operational has been relatively assessed as weeks, months, years and decades. If a given technique is only effective over a period in the order of years to decades then its overall feasibility is diminished.

A sustainable approach can help to ensure that the benefit of doing the remediation is greater than its impact.

The table below summarises the possible remedial options and assesses each against the six key criteria listed above:

Remedial Activity	Effective	Relative Cost	Operational Time	Comments (Practicality / Sustainability / Durability)	Feasible
Civil Engineering Methods					
Excavation and Disposal (may also require pre-treatment by screening & sorting).	Yes	£££	Weeks	Effectively removes the source of the contamination, but is much less sustainable compared to other feasible options (excessive cost, take up of landfill space, transport issues, need to replace with clean material)	Not required in relation to soils based on current testing; may be applicable if unexpected contamination is encountered such as former infilled bunkers.
Materials Management (Excavation and Re-Use of Suitable Materials)	Yes	££	Weeks	Excavation and re-use of any suitable materials and potential re-use of treated materials at a suitable depth. Would need to be undertaken in association with a Materials Management Plan (MMP) prepared in accordance with the CLAIRE Definition of Waste Code of Practice and signed off by a Qualified Person. *Alternatives are U1 exemption, WFD exemption etc..*	Earthworks and level changes required on the development; no soil contamination identified but a potentially effective way of dealing with any unexpected contamination.
New water supply pipelines	Yes	£	Weeks	Barrier pipe will prevent leaching of contaminants into water supply. Barrier Pipe is highly durable and practical to install.	Site is brownfield and assumed barrier pipe would be installed, risk assessmnet from utility provider (Welsh Water) required if PE selected.
Radon Protection Measures	Yes	£	Weeks	Installation of proprietary radon protection measures to prevent ingress of radon gas. Readily available and practical to install. Suitable for the lifetime of the development, relatively sustainable.	Yes, widely accepted remediation technique to protect from radon.
Biological Methods					
Not considered to be relevant to the subject site.					
Chemical Methods					
Not considered to be relevant to the subject site.					
Physical Methods					
Hand Picking (of ACM)	Yes	£	Weeks	Hand picking visible ACM fragments using trained operatives during excavation works.	No identified on site to date, but yes potentially feasible if visible fragments of ACM are

Remedial Activity	Effective	Relative Cost	Operational Time	Comments (Practicality / Sustainability / Durability)	Feasible
					encountered within the soils during groundworks.
Passive Methods					
Not considered to be relevant to the subject site.					

4.2 Selected Remedial Options

Based on the above remedial options appraisal, the most appropriate approach to the residual risks is to install radon protection measures within proposed structures.

The option selected has been chosen because it is considered to be effective, can be carried out practically within the available time periods and are commercially viable.

In addition, it is assumed barrier pipe would be adopted for potable water supplies given the site's brownfield use; if PE is required then this should be confirmed with Welsh Water.

As potential options to manage unexpected contamination, options available include excavation and disposal, re-use under material management and, if discovered, hand picking of ACMs, if required, with appropriate off-site disposal of any identified ACM – noting that no asbestos has been identified on site to date.

A post development CSM is presented on drawing reference C6668/03.

4.3 Site Remediation Requirements

The key requirements are summarised in the table below:

Source	Contaminants of Concern	Remediation Method	Further Details / Remedial Requirements
1 – Natural Geology	Radon Gas	Basic radon protection measures – radon resistant membrane	Basic radon protection measures typically comprise the installation of a suitable radon resistant membrane across the building footprint. The measures should be designed and installed in accordance with current guidance including BRE Report BR 211 and relevant Building Regulations requirements.

In addition to the specific remedial requirements listed in the tables above which are intended to mitigate the risks from known sources, it is recommended that a non-specialist watching brief be maintained during the groundworks and construction for any evidence of contamination and BSL consulted for advice.

Detailed requirements are discussed in section 5.0 below. Note where the word "clean" is used from here on, the definition of this shall mean chemically suitable for the intended use.

5.0 DETAILED REMEDIAL REQUIREMENTS AND OTHER CONSTRAINTS

5.1 General

This section is intended to fulfil the requirements of LCRM Stage 3: Remediation and Verification.

All remedial works are to be overseen by suitably experienced and qualified site staff and a site watching brief will be in place alongside regular visits by a suitably qualified person to undertake the necessary verification works described.

The table below provides a summary of requirements in terms of the approximate order of works. It should be noted that the precise sequencing has not yet been confirmed by an appointed Contractor. This Remediation Strategy may also be subject to revision, dependant on the requirements of the regulators.

Task	Description
1.	**Pre-Commencement** • Approval of this Remediation Strategy with the Local Authority, Warranty Provider and Natural Resources Wales (NRW) prior to site works commencing. • Appointment of contractor for the works, who is to obtain appropriate permits, licences and approvals. Other appointments as per CDM requirements. • Production and declaration of a Materials Management Plan (MMP) under the DoWCoP prior to any works commencing or confirmation of waste exceptions (U1) to be in place.
2.	**Site Clearance, Excavation and Re-use of Site Won Material and Importation of Soils, if required (Earthworks)** Subject to all necessary ecological and arboricultural surveys being undertaken and appropriate mitigation measures in place, the site should be cleared and any vegetation below areas of proposed development should be stripped. Excavation, screening, treatment (if required) and engineering / re-use of soils where suitable, to an appropriate Earthworks Specification in accordance with CC 601, including grubbing out of any relict construction. A non-specialist watching brief should be maintained during groundwork for any previously unidentified contamination.
3.	**Installation of Radon Protection Measures** Installation of ground gas protection measures to comply with BRE211.
4.	**Placement of Soft Landscaping Area Soils** Importation and placement of soils to act as a suitable growing medium in soft landscaping areas, if required Imported soils should meet the chemical criteria outlined in Appendix A.
5.	**Verification and Reporting of Remedial Work** The radon protection system will require verification. Collation of information relating works including material movements and waste transfer documentation where appropriate. A closure Verification Report will be required to close out the declared Materials Management Plan and submitted to CL:AIRE. Complete remedial validation report(s) in line with regulatory guidance and warranty provider requirements. The report(s) should be submitted to the Local Authority, NRW and warranty provider for approval following completion.

5.2 Earthworks

General Considerations
Work procedures should be designed to minimise the risk of dust becoming airborne by suitable means, such as keeping the exposed soils damp or covered at all times. It is important that the control measures in place are sufficiently robust to prevent release of contaminated dust into the surrounding environment.

Geotechnical Considerations
Whilst geotechnical aspects are not specifically considered within this Remediation Strategy, all earthworks should be undertaken in accordance with an appropriate Earthworks' Specification.

If present, unsuitable materials (e.g. timber, metals and plastics) removed during screening should be segregated and stored in a suitable location prior to off-site disposal to a suitable licence facility. Where practicable materials should be re-used or recycled.

The contractor should consider controlling groundwater entry into excavations (mainly applicable to the southern part of the site).

Materials Management
Any works involving the movement of soils within the site boundary shall be done in accordance with a Materials Management Plan (MMP) under the CL:AIRE Definition of Waste Code of Practice (CoP) or shall be done in accordance with an appropriate exception (U1). Further guidance is presented in Appendix B.

To implement the DoWCoP, there is a requirement to notify the Environment Agency and Local Authority of the intention to use the code of practice in principal, after which there is a 21-day notice period for their response.

In order to re-use soils under the DoWCoP, there are four key criteria that need to be met:

- The aims and objectives of the project meet the requirements of the Waste Framework Directive.
- The soils can be demonstrated to be suitable for use (backed up by chemical/geotechnical testing and assessment).
- There is certainty of use (i.e. materials tacking which should be in place as part of good site practice in any case).
- Quantity (the quantity of materials used should be known).

Information on existing site levels, proposed levels, volumes generated (e.g. foundation / drainage excavation arisings) would need to be known in order to complete the MMP.

If the DoWCoP is the chosen route, it is an absolute that the MMP should be in place and declared by a Qualified Persons (QP) before works commence, otherwise excavated soils could constitute an illegal deposit of waste and enforcement action could be taken by the EA and HMRC.

In regard to "clean" naturally occurring soils only that are to be re-used on their site of origin, these are covered by a Waste Framework Directive (WFD) exclusion. So long as the project can prove the four criteria (listed above) then permits or the DoWCoP are not required. However, many projects still use the DoWCoP to ensure compliance.

Re-use of soils containing asbestos should comply with the CL:AIRE publication 'Interpretation for Managing and working with Asbestos in Soil and Construction and Demolition Materials' (CAR-SOILTM) and CAR 2012.

In terms of the re-use of brick/concrete crush materials, the DoWCoP does cover aggregates, but only on the site of origin and the EA WRAP aggregate Quality Protocol might best apply to ensure quality standards.

Imported Materials and Materials for Re-use
Any soils or materials imported or to be re-used as part of the works should be tested for chemical compliance and suitability in line with the guidance stipulated in Appendix A and the proposed end use.

Any imported material should be approved by BSL and the Local Authority prior to being imported onto site.

Where feasible, imported topsoil should conform to the requirements of BS 3882:2015 (Specification for Topsoil and requirements for use), or as agreed with the client. Imported subsoil should also conform to the requirements of BS 38601:2013 (Specification for subsoil and requirements for use), or as agreed with the client.

In addition, all materials must be free from aggressive / invasive weeds (such as Japanese Knotweed and Giant Hogweed) and bulk vegetative growth.

Asbestos Impacted Soils (if encountered)
During the excavation, sorting and screening of soils, any easily identifiable asbestos containing material (e.g. asbestos cement sheeting tile etc) shall be removed by hand picking and disposed off-site to a suitably licensed waste facility by a suitably qualified and licensed contractor.

The reuse of excavated soils contaminated by asbestos should also be carried out in accordance with "Control of Asbestos Regulations 2012: Interpretation for Managing and Working with Asbestos in Soil and Construction & Demolition materials: Industry Guidance (shortened name CAR-SOILS™)" with work requirements assessed by a competent person in line with the Joint Industry Working Group (JIWG) Decision Support Tool for CAR 2012 Work Categories (i.e. are the works notifiable or not and are they non-licenced or licenced).

Re-use of Asbestos Impacted Soils (if encountered)
In terms of materials placement (i.e. re-use), if implemented, the following criteria will deliver a site that is suitable for use in terms of asbestos risk (applicable to the built environment only):

- Soils between finished ground level to 0.60m depth must be characterised by nil asbestos.
- Soils below 0.60m depth or directly beneath building plots (i.e. below hardstanding, floor slabs, driveways etc) and adopted highways/pavements must be characterised by asbestos at or <0.001% w/w asbestos.
- For soils >1.00m below finished ground levels, asbestos in soils should be<0.1% w/w and providing that asbestos contaminated soils are placed below this depth, then it is considered that there is no risk to human health. Efforts should be made to remove any visible ACM, providing it is practical to do so and does not generate any increased level of risk.

Provision will need to be made for hand picking of identifiable asbestos containing materials where observed and these materials will need to be placed in a locked skip prior to disposal to an appropriate waste facility.

These criteria have been used on similar sites to the satisfaction of the local regulatory authority.

Records of all activities undertaken, especially where soils containing 0.1% w/w to 0.001% w/w are placed below 1.00m, should be kept in a Health & Safety file for future reference, noting that this primarily applies

to persons engaged in excavation works below 1.00m depth. CAT B training is likely to be required for operatives excavating below these depths, although the contractor should undertake their own risk assessments to confirm requirements.

Well Decommissioning
In line with current industry good practice, existing monitoring wells should be decommissioned to remove potential pathways within the building footprint. Covers and pipe shall be removed, and the resultant annulus filled with bentonite grout or concrete in accordance with EA guidance. Photographic evidence is required.

5.3 Ground Gas, Vapours and Radon Protection Design

Mitigation measures will be required to comply with BRE211 (2023) for radon for basic protection.

A ground bearing floor slab is to be adopted as per Adept Consulting "GROUND FLOOR SLAB GA SHEETS 1-3" 100.25085-ACE-XX-00-DR-S-5000 included in Appendix C.

Following BRE 211, it is recommended that a radon resistant membrane is installed within the floor slab build up of the proposed structure, suitably detailed around corners and penetrations and taken through to the outer layer of wall construction for continuity across the whole structure.

The protection system will utilise the Visqueen RadonBlok 600 membrane, which shall be installed as per the manufacturer's instructions, with minimum 150mm overlaps, bonded with Visqueen RadonBlok Double Sided Tape and sealed with VisqueenPro Single Sided Tape. If heat welding is adopted as an alternative to tape then the weld is typically 35mm in width.

Once the membrane is installed it will require protection from follow on trades, either in the form of an immediate pour of screed or in the form of a protection fleece using Visqueen TreadGUARD 300 over trafficked areas. Concrete pours shall be coordinated so that plant/machinery and site staff avoid areas of the installed membrane to prevent damage.

All service entry ducts will require sealing to minimise ingress through preferential pathways, utilising either Visqueen top hats or detailed using Visqueen Pro Detailing Strip. Steel stanchions shall also be detailed using Visqueen Pro Detailing Strip. Ducts will also require sealing with Filoseal+ Duct Seal to prevent gas entry through the duct itself.

Indicative details of the radon protection system are included on Drawing C6668/04 included in Appendix C, alongside data sheets for the products to be utilised.

Installed ground gas protection measures will require verification in line with BRE211 and CIRIA C735 requirements. In order to address the methods of installation and set out requirements for the verification, a Ground Gas Protection Systems Verification Plan is included in Section 7.5.

5.4 Importation of Soft Landscaping Soils (if required)

Soils may be required to be imported to site for placement in soft landscaped areas to act as a growing medium. The topsoil layer should be a minimum thickness of 100mm, although soil depths needed for planting should also be confirmed with a landscape architect. Imported soils to be used should meet the chemical criteria outlined in Appendix A.

It should be noted that the screening criteria and scenarios adopted within Appendix A are conservative, thus an exceedance of a contaminant will not necessarily deem the material to be unsuitable. Any

exceedances detected and overall material suitability will be assessed on a case by case basis, with the results included and discussed in the Validation Report.

5.5 Records

Accurate records and as-built drawings will need to be kept, updated and provided for all aspects of the remedial works as they progress.

The construction works should be devised in a way to allow the maximum re-use of site won materials adhering to current waste regulations. To allow this and demonstrate compliance with Waste Management Licensing Regulations the Contractor should maintain an accurate Materials Management Plan (MMP). These shall show the source, description, classification and placement location of all fill used on the site. The plans shall be revised regularly with archive versions maintained for future reporting purposes. The MMP should show the extent of any excavations undertaken on site.

5.6 Stockpile Management

Segregation of materials and stockpiles should be maintained, and accurate records kept to avoid the potential for cross contamination. Good site practice for stockpile management includes, but is not limited to:

- Damping down of the site surface, excavations and stockpiles to prevent the generation of dust (wind blown asbestos fibres can contaminate "clean" topsoil stockpiles potentially resulting in expensive disposal costs).
- Stockpiles sizes should be kept to a minimum to reduce 'wind whip' causing potentially hazardous material to be blown from the pile.
- Once at the intended size, stockpiles should be "sealed" to ensure no excess materials are placed and mixed into the stockpiled to prevent cross contamination.
- Clean, validated material proposed for re-use as part of the cover system should ideally be placed on a suitable polythene membrane or clean concrete hardstanding to prevent any cross contamination.
- Appropriate loading of plant to prevent spillages.
- Appropriate signage should be displayed so that site workers/visitors are aware of the intended use and are alerted to the potential hazards associated with the material to be stored on site.

Examples of good site practice for stockpile management are presented below:

Stockpile sealed and cordoned off with warning sign	Sheeting of contaminated materials
	

5.7 Testing

All samples will be taken in accordance with relevant guidance (e.g. BS 10175:2026) by and independent suitably qualified Geo-Environmental Consultant.

Contaminated material for disposal should be tested to define the most economical disposal route. In addition, any material to be imported to the site shall be tested and its suitability demonstrated prior to it being brought to the site.

The geotechnical suitability of site-won materials will be confirmed before reuse, by appropriate earthworks testing, in accordance with an Earthworks Specification (preparation of which is outside the scope of this Remediation Strategy).

5.8 Permits

The appointed contractor will need to hold or obtain relevant waste permits or exemptions (where applicable) in accordance with the Environmental Permitting Regulations 2016 to carry out waste recovery, treatment and re-use activities on site. Alternatively, waste recovery and re-use operations shall be in accordance with the CL:AIRE Definition of Waste Code of Practice (DoWCoP), 2011 and an approved Materials Management Plan (MMP) declared under the DoWCoP by a Qualified Person (QP).

A crusher/screener will also require a waste permit or exemption. Aggregates should be processed in accordance with relevant WRAP Quality Protocol to produce a non-waste product.

It is the contractor's duty of care to ensure that any waste to be treated or disposed off-site is transported by a licenced waste carrier and that the waste facility is licenced, permitted or holds an appropriate exemption.

Evidence of the above should be maintained and provided on request along with any waste transfer or consignment notes for materials removed off-site.

5.9 Surface Water Runoff

The contractor should provide and maintain means to intercept surface run off in accordance with good site practice. Run-off from the site shall not be allowed to enter adjacent waterways or drainage gullies without the permission of the Drainage and Highway Authorities.

Surface waters from the site shall be discharged to the mains sewer under consent from the local Water Authority.

It should be noted that groundwater impacted by hydrocarbons may require some form of treatment prior to discharge, alternatively if only small amounts of water are encountered, this could be stored and removed to a suitable waste disposal facility.

5.10 Unexpected Contamination

If any unexpected contaminated materials are encountered by the contractor, then works should cease in that area and the contractor should consulted BSL for advice prior to any irrevocable action at the site.

6.0 STAKEHOLDERS AND RESPONSIBILTIES

6.1 Key Stakeholders

A summary of the key project stakeholders is presented below (not exhaustive):

Client / Developer	Consultant	Contractor	CDM Stakeholders	Regulators
FI Construction	Brownfield Solutions Ltd (BSL)	Remediation and Groundworks Contractors (FI Construction)	Principal Contractor (FI Construction) Principal Designer (TBC) Health and Safety Executive (HSE)	Wrexham County Borough Council (regulator - Human Health risk and planning consent) Natural Resources Wales (NRW) (regulator - controlled waters and waste) Warranty provider (TBC)

6.2 Client

The remediation works will come under the umbrella of CDM 2015 Regulations. The Client is responsible for formally appointing a Principal Designer and Principal Contractor, otherwise the Client assumes the role of Principal Designer. All pre-construction information will need to be made available to the appointed duty holders and sufficient time and resources allowed.

6.3 Consultant/Engineer (Client's Representative)

A suitably qualified Geo-Environmental Consultant should be appointed as the client's representative to oversee the works, who will have a visiting role throughout and provide advice when required.

They should be responsible for:

- Providing appropriate supervision of the remedial works (either part time or full time).
- Monitoring the works to ensure compliance with this strategy and specification.
- Audit testing of materials. (However, it is the responsibility of the contractors to demonstrate the suitability/acceptability and the compliance of the material with the specification).
- Approval of test results.
- Validation of the works.

They will maintain records of the works to include the following:

- Record sheets to include a summary of the activities.
- Aspects relating to Environmental Control or non-compliance with this strategy.
- Test Results.

Liaison will be carried out with relevant regulators prior to commencing on site. The design of the Remediation Strategy can be adapted to avoid unnecessary delays at a later date.

Validation information will be supplied to the Local Authority for approval in a Verification Report. The report will include relevant site records and stand as certification that the remedial works have been carried out in accordance with this strategy.

6.4 Contractor

The contractor appointed to oversee the development construction works should comply with the following regulations, guidance and legislation relating to the works:

- Environmental Protection Act 1990.
- Health and Safety Executive "Protection of Workers and the General Public during the Redevelopment of Contaminated Land", HS(G)66, HMSO 1991.
- Duty of Care Regulations 1991.
- Water Resources Act 1991.
- Water Industry Act 1991.
- Environment Act 1995.
- The Control of Substances Hazardous to Health Regulations 2002.
- Hazardous Waste Regulations.
- Control of Asbestos Regulations (CAR) 2012.
- Control of Asbestos Regulations 2012: Interpretation for Managing and Working with Asbestos in Soil and Construction & Demolition materials: Industry Guidance (shortened name CAR-SOIL™)".
- The Construction, Design and Management Regulations 2015.

The contractor should provide adequate supervision for all the site works. This shall include a suitably experienced Site Manager who will validate the work and maintain records allowing preparation of a validation report for the works.

The appointed contractors will be responsible for maintaining all records in connection with the works.

Records shall include details of:

- All the material imported to the site (including volume, source and chemical composition).
- All the material exported from the site (including volume, destination and chemical composition).
- The size and extent of the remedial excavations (lateral extent and depth plotted on suitable plans).
- Any treatment undertaken.
- Details of the contractor's waste exemptions, if applicable.
- Discharge of any groundwater.

6.5 CDM Stakeholders - Health & Safety

The appointed Principal Contractor (PC) will need to produce a Construction Phase Plan for the work, prepare risk assessments and method statements. The PC will be responsible for the coordination of welfare and H&S matters on-site including sub-contractors.

The Principal Designer/Client will review the Construction Phase Plan and notify the local office of the Health and Safety Executive (HSE) of the works prior to commencing (via form F10). Unless otherwise agreed with the client, the table below provides a broad outline of the overall project team.

All works should be carried out in a manner that will safeguard all site employees. This should include but not be limited to; site induction for all staff and visitors, training/safety awareness training, issue of Personal Protective Equipment (PPE) and the provision of suitable welfare facilities. Further advice is

provided within HSE publication 'HSG 66 Protection of Workers and the General Public during Redevelopment of Contaminated Land'.

The works should be carried out in a manner to protect against damage to property or nuisance to property or persons on the site or within its immediate vicinity. Noise and dust issues should be considered. Members of the public should be excluded from the works areas and the contractor should maintain suitable security to ensure unauthorised persons cannot access the works.

Appropriate temporary protection and warning signs should be erected to warn of hazards that may result as a consequence of the works.

6.6 Regulators

Implement the regulations and environmental standards set by government. The contents of this report will need to be agreed in advance of works with the regulators.

7.0 VERIFICATION PLAN

7.1 Watching Brief

It is recommended that a non-specialist watching brief be maintained during the groundworks and construction for any evidence of contamination and BSL consulted for advice. Guidance is provided in Appendix D. A statement will be required from the contractor following completion of groundworks to confirm or otherwise if unexpected contamination was identified.

7.2 Imported Soft Landscaping Soils

Soils used within soft landscaping topsoil/subsoil will comply with the chemical specification and testing rates provided within Appendix A. There are no requirements for depth validation at this site.

Prior to importing any soils, test results for the proposed import will be provided to the client's representative consultant, alongside the confirmation of the source (greenfield/brownfield etc).

7.3 Well Decommissioning

Any monitoring wells within the building footprint should be decommissioned in accordance with EA guidance and backfilled with a low permeability material (i.e. concrete or bentonite). For decommissioned wells, photographic evidence should be provided of their removal and infilling.

7.4 Contingency Planning

Should significantly contaminated material be encountered during the development (e.g. gross hydrocarbon impaction) then a suitably qualified geo-environmental consultant should be contacted for advice. Measures may include the excavation of the material which should stockpiled on 2000-gauge polythene sheeting, sampled and tested for an appropriate range of contaminants.

Once the laboratory analysis of the material is available, an assessment will be undertaken to determine whether it will need to be disposed off-site to a suitable facility or if the materials could be retained on site re-used with or without some form of treatment within regulatory requirements.

Depending on the nature of any such impact it may be necessary to undertake validation testing of the excavation faces in order to demonstrate that no such materials are left in-situ.

Should gross asbestos contamination be identified, then all works should cease until an Asbestos Management Plan is put into place (if not done so already) and remedial requirements are confirmed by a suitably qualified geo-environmental engineer. Note remedial works under such instances may be classified as either licenced or non-licenced and may be notifiable to the Health and Safety Executive (HSE). Works would need to comply with CAR 2012 and CARSOILS™.

7.5 Long Term Monitoring Requirements

BSL can confirm that there are no long-term monitoring requirements at the site in respect to soils and groundwater contamination, noting that separate HSE regulations apply to the monitoring of radon in workplaces. No further action is considered to be required in respect to Condition 12 in respect to long term monitoring.

7.6 Radon Protection Systems

Pre-Start Meeting and Requirements
Prior to installation, a pre-starting meeting should be held to discuss requirements between the installer, the verifier and site managers. This should help mitigate delays during the verification process.

The installer will be checked by the verifier (BSL) as to why they are considered appropriate to undertake the role, prior to construction. To aid this, the installer should provide their RAMS to BSL for records. Evidence of any qualifications and past experience will be required to be provided to BSL prior to installation and should be checked on site.

Attendance for verification is required prior to the placement of any construction over the installed membrane (e.g. before laying insulation or a concrete pour).

Each area will be verified individually during the installation of the protection systems. Due to the nature of the proposed commercial development, the installed protection systems will likely be verified in sections as they become available, closely liaising with the site manager in regard to progress.

Records of installation shall be maintained by the verifier and installer and once all proposed installations are complete, a copy of the records will be issued within a separate Verification Report.

The Installer
The ground gas protection system will be installed as per the manufacturers recommendations and the design drawings.

Prior to the installation of protection system, all on site personnel should be made aware of the presence of the installed membrane and should be informed that damage needs to be prevented. Adequate protection of the gas membrane (appropriate to the build sequences of follow-on trades and the robustness of the membrane used) will always be required to ensure that installed gas resistant membranes have retained their integrity. A warning label to display and assist is included in Appendix D.

It is essential that an appropriately experienced and qualified workforce is employed on site to install ground gas protection systems.

Since the site is assessed low risk basic radon protection area (Table A2 of CIRIA C735), a general builder/groundworker with relevant experience, but no relevant formal qualification in gas membrane installation could be employed. However, the verifier (consultant or qualified and experienced installer) will be required to conduct a thorough verification (visual) inspection prior to all concrete pours.

If personnel undertaking the installation will be specifically qualified in Cskills Awards L2 NVQ Diploma in sub-structure work occupations (construction) – installation of gas membranes, then the verifier (consultant) should conduct a thorough verification (visual) inspection prior to 25 per cent concrete pours (min two visits).

Evidence of qualification will be required to be provided to BSL prior to installation and should be checked on site.

The installer will also be required to maintain their own records of installation, which will include sign off sheets detailing areas and dates of installation alongside photos of before, during and after installation. This information is required by BSL to be included in our Verification report.

The installer shall notify the independent verifier of progress so that they can visit site and conduct verification in accordance with above scope.

The Independent Verifier
The installation of the ground gas protection systems shall be visually inspected and verified by an independent and suitably competent ground engineering professional or third party independent qualified and experienced installer. The competence of BSL verifiers is presented in Appendix C.

It will be necessary for the verifier to attend site prior to the installation of the membrane in order to discuss requirements and view the floor slab construction/ventilation systems. Note that prior to attending site, the verifier will require each area ready for inspection to be free of overlap/lapping tape on all seams where applicable during the visit.

When installed, the verifier will check the membrane used meets the requirements set out within this Verification Plan.

Edges, walls, pillars, service entries etc. will be checked that they have enough overlap in accordance with the manufacture's specification. The inspection should cover floor areas, paying attention to walls and any other detailed locations. Areas where the membrane may be bridging across unsupported will be checked. Any discrepancies with the design drawings should be highlighted.

BSL reserves the right to increase levels of inspection should the quality of installation of the membrane deteriorate significantly over any phase of the construction works.

During the inspections, photographs will be taken as evidence and a pro forma check sheet will be used to record the assessment of the installation of the required ground gas precautions. A plan detailing which areas of the structure have been installed/verified shall also be maintained. A copy of the pro forma is presented in Appendix C.

Repairs should be instructed and observed on the same day as the site visit or re-inspected later.

Systems taken to minimise any damage to membranes whilst working (e.g. placement of insulation) will also be recorded and reported. A warning label to display and assist is included in Appendix C.

Integrity testing
Integrity testing is not a substitute for well designed and installed gas protection systems. When used, integrity testing should always be combined with visual inspection.

To ensure a high standard installation, mechanical point stressing to ASTM D4437-08:2013) will be carried during the visual inspection which involves running a blunt instrument (e.g. a blunted pick) along the edge of the seam to identify any unbonded seams. The instrument used should not puncture the gas membrane.

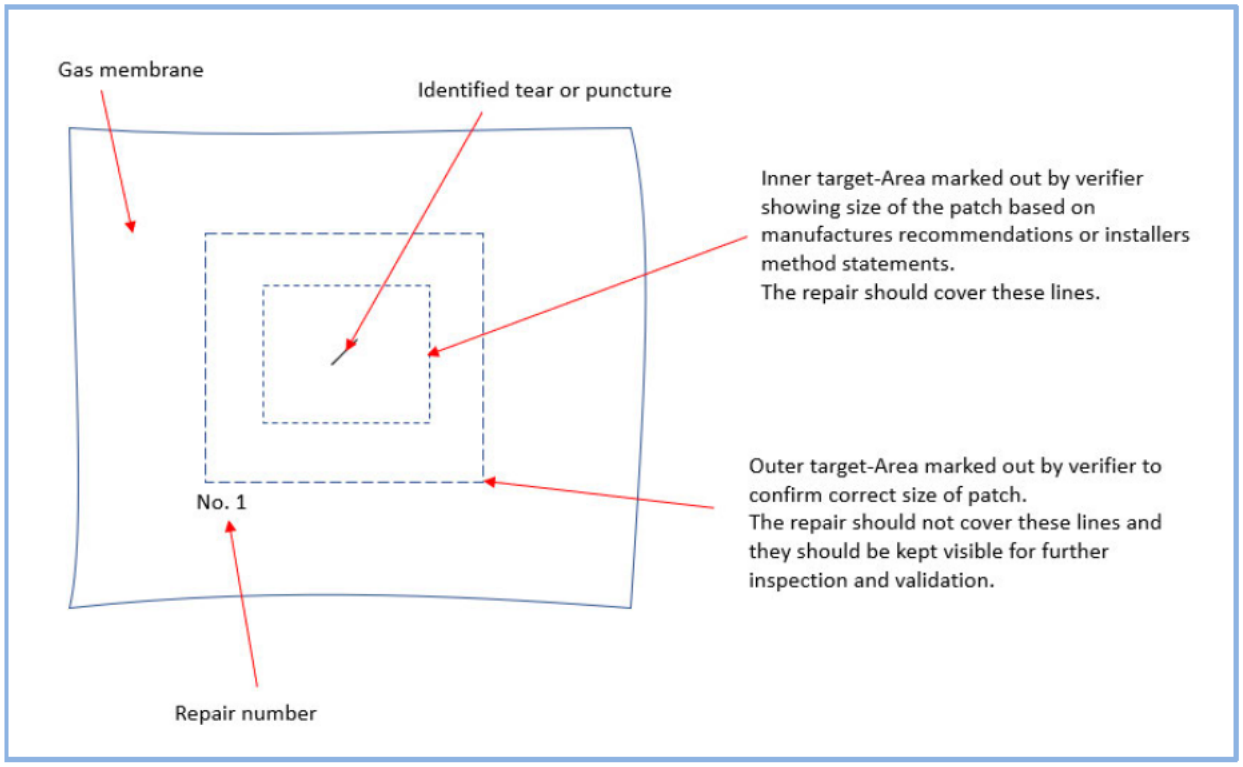
Non-Conformances
If installed incorrectly or damaged during the construction process, the membrane is rendered ineffective and will fail to provide adequate protection against the ingress of ground gas or vapours.

All damaged areas should be repaired in accordance with the manufacturer's instructions/installers method statements, ensuring a minimum lap is maintained and the repair subsequently verified. No bridging of unsupported membrane is permitted.

The following procedure will apply for any identified non-conformances:

- Damaged areas will be marked on site using a permanent marker (e.g. BSL, date, initials) and photographed to be included in the final verification report.
- The mark will highlight the area to be patched or repaired, maintaining a suitable lap.
- Verbally inform the installers on site of the repair(s) for them to address.
- When repaired, the area(s) will then be inspected again (re-verified).
- Once repaired to a satisfactory standard, a second mark will then be placed outside of the highlighted area to indicate the location of the repair (e.g. BSL, date, initials, repaired and a tick mark) with photographic evidence of the repair taken to be included in the final verification report.
- If there are a very high number of non-conformances and installation is generally very poor, do not attempt to identify all non-conformances; stop works and discuss the issues with the installer and the site manager. Indicate that the installation is not to a satisfactory standard and that further training should be provided prior to continuing installation, with re-verification once addressed.
- Where repairs can be reasonably achieved during the allotted time available for the inspection visit, then re-verification be conducted. Where this cannot be achieved; additional visits will be required.

The below diagram provides a sketch of typical repair requirements:



Following each inspection visit, the verifier will provide a verbal summary of their findings to the site manager and/or client.

It should be noted that on rare occasions, the BSL engineer carrying out the verification works may accidentally cause damage to the membrane during the verification visit by walking over the membrane. This typically occurs when the underside of the membrane has not been suitably cleared of debris prior to laying. Should this occur then a non-conformance will be recorded, and a repair will be required. BSL and the engineer in attendance shall not be held accountable for such damage unless it is proven to have been deliberate.

A time allowance should be made during the construction phase to address non-conformance highlighted during inspection. Incorrect installation may have an impact on timescales for concrete pours and

subsequent follow on works, therefore good workmanship is essential to save on time and potential additional costs/delays.

If changes to the development design or installers method statement take place during construction, then these changes must be communicated to the verifier to ensure requirements continue to be met.

Gross non-conformance (e.g. inaccurate records or no records of installation whatsoever) may result in not achieving regulatory sign off, which may have significant financial implications.

Note that any form of abusive or threatening behaviour, deception, bribery or other corruptive activity towards BSL and its staff before, during or after verification activities will potentially result in our services being suspended with immediate effect and withdrawn where such activity has been shown to have occurred.

Post Verification
Once the installed membrane has been verified and all non-conformances addressed, it will be considered acceptable. Once acceptable the membrane should be protected from follow on trades as best as possible (e.g. placement of insulation over the membrane to avoid damage). Any damage to the membrane after this will render the gas protection systems unsuitable and BSL should be advised immediately. Repair works and re-verification may be required in that instance.

It is not the Verifier or the Installers responsibility to ensure that all follow-on works are aware of the risk to damage to the gas protection systems present at the site.

The importance of the membrane will need to be communicated to all site personnel during the site induction. It is recommended that the Warning Notice provided in Appendix F is displayed in a number of clear locations to indicate the presence of the membrane and to avoid damage to this element.

We also strongly recommend that any follow-on trades responsible for preparing sub-base surfaces for gas protection systems are made aware of finishing requirements. Damage to the installed membrane can be minimised by providing toolbox talks given to follow on trades and by the use of sacrificial protection layers applied where traffic across the exposed membrane is necessary.

Note that if damage is caused to a gas protection system by follow on trades post verification and BSL observe this, then BSL reserves the right to retract any Verification Report until suitable repairs are completed and revalidated.

7.7 Verification Reporting

On receipt of all information, the appointed Geo-Environmental Consultant will compile a Verification Report(s). The report will be a concise document that provides records and collected evidence of the remediation carried out at the site. The final report should contain:

- Introduction, including description of the project and background to the works.
- Summary references to site investigation data, risk assessments and the Remediation Strategy.
- A description of the works undertaken and any treatment records.
- Details of chemical validation testing.
- Reference to the MMP (if utilised – see below).
- Details of how any out of specification materials were dealt with and final destination, including waste transfer notes.
- Appropriate site plans and photographic record.
- Conclusions, detailing any additional works that may be required.

- Details of any long term monitoring requirements, if any.

For Materials Management, the verification report shall include (as per listed within V2 of the DoWCoP):

- Appropriate site plans.
- Experience and qualifications of the person preparing the report in relation to the
- specific project.
- Description of how the use of materials links with the Remediation Strategy or Design Statement.
- Reference to site investigation data.
- Reference to risk assessments (including qualitative risk assessments).
- Reference to the MMP and associated tracking system, including any deviations and why.
- The suitable for use criteria adopted.
- Any treatment records.
- Reference to waste transfer documentation, including return loads (this may not be applicable to the use of materials within the Site of Origin scenario).
- Signed delivery tickets (possibly as an annex or alternatively there must be a clear
- reference out to them – this may not be applicable to the use of materials within the Site of Origin scenario).
- Record of contingency arrangement(s) that had to be implemented (if any).
- Record of quantity of materials used.
- Copies of signed Declaration(s) by Qualified Person(s).

For Ground Gas Protection Systems the report shall also include:

- A description of the inspection regime.
- A description of the elements of the ground gas protection system.
- A presentation of the material specifications etc.
- Dates of inspection, inspection staff present, weather conditions and the surrounding trades activity.
- Specifics relating to the level of training, competency and accuracy of the installation team.
- Installation photos.
- Recognised defects and repairs.
- Areas inspected along sectors and grid lines if appropriate.
- Areas of limitation: areas unable to be inspected, identified and noted.
- Records of CPD and any certifications that the verifier holds (staff competency).

This should then be submitted to the regulators and warranty providers for approval, which should close out the requirements of this Remediation Strategy.

8.0 REFERENCES

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DRAWINGS



	Description	By	Date
T1	Stage 4 Initial issue	LM	30.09.25
T2	Parking spaces added	LM	19.11.25
T3	Tenant boundary adjusted	LM	02.12.25
T4	Tenant boundary adjusted	LM	10.12.25
T5	Tender Issue	LM	12.12.25
T6	Building set out	LM	10.02.26
T7	Bin store relocated	LM	30.03.26
T8	Annotation update	LM	01.04.26
T9	Oak Road crossing	LM	17.04.26

1 Proposed Site Plan
Scale 1 : 1250

MCAU
Modern City Architecture & Urbanism
Avenue HQ
17 Mann Island
Liverpool
L3 1BP
t: 0161 974 7203
e: info@mcau.co.uk
www.mcau.co.uk

Client
F.I Real Estate Management

Project
The Oaks
Wrexham

Description
Proposed Site Plan

Status
Stage 4 Technical Design

Drawn By
LM

Job Number
1256-MCAU

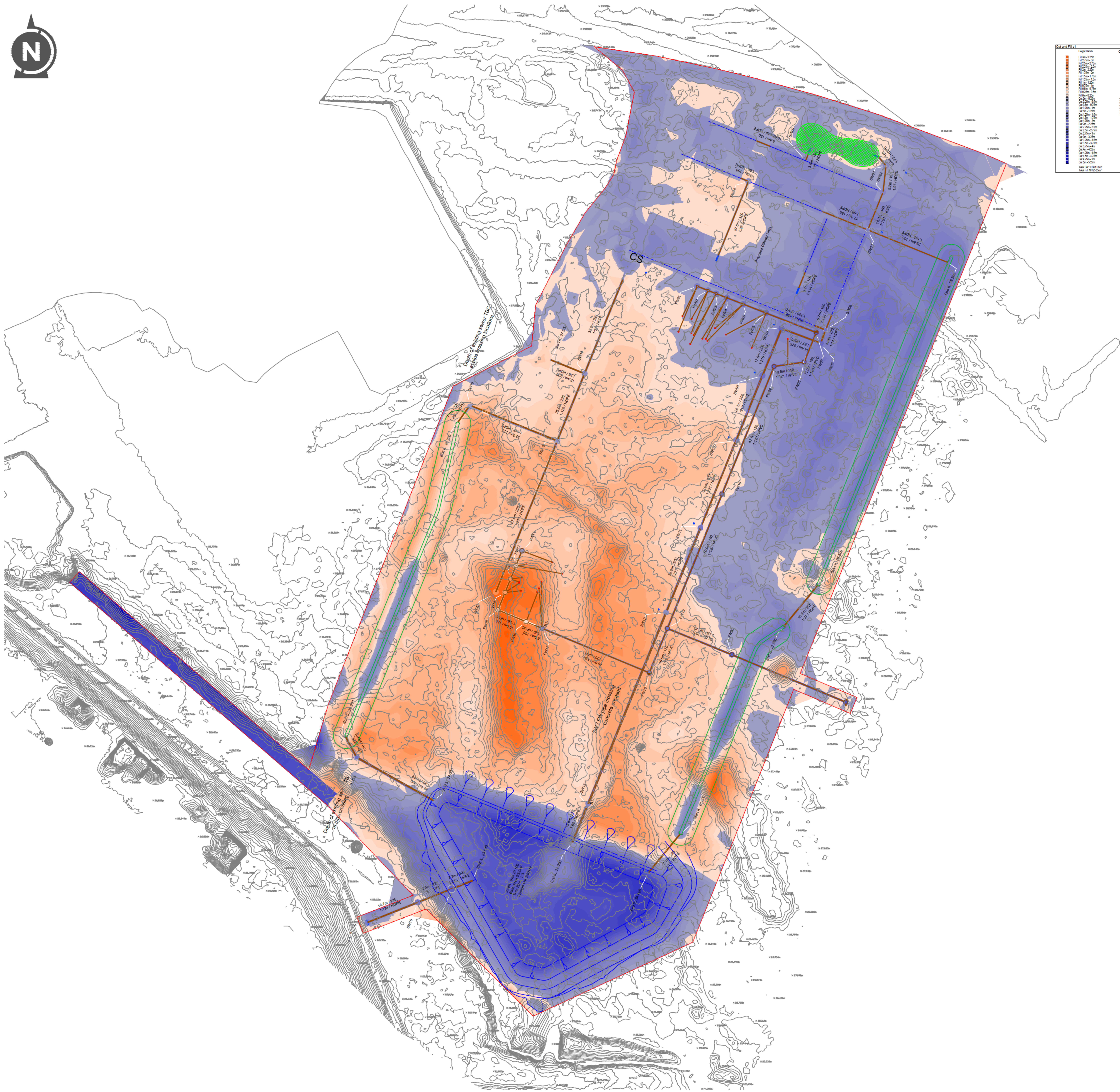
Scale
1:1250@A1

Date
Sep 25

Drawing Number
T.02-00-001

Revision
T9

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Cut and Fill v1

	Height Bands	Cut Volume	Fill Volume
	Fill 3m - 3.25m	–	0.90m³
	Fill 2.75m - 3m	–	33.04m³
	Fill 2.5m - 2.75m	–	83.37m³
	Fill 2.25m - 2.5m	–	148.75m³
	Fill 2m - 2.25m	–	251.03m³
	Fill 1.75m - 2m	–	381.91m³
	Fill 1.5m - 1.75m	–	605.37m³
	Fill 1.25m - 1.5m	–	957.28m³
	Fill 1m - 1.25m	–	1483.80m³
	Fill 0.75m - 1m	–	2246.20m³
	Fill 0.5m - 0.75m	–	3090.49m³
	Fill 0.25m - 0.5m	–	3939.41m³
	Fill 0m - 0.25m	–	4903.70m³
	Cut 0m - 0.25m	4807.50m³	–
	Cut 0.25m - 0.5m	3774.73m³	–
	Cut 0.5m - 0.75m	2956.28m³	–
	Cut 0.75m - 1m	2224.34m³	–
	Cut 1m - 1.25m	1583.99m³	–
	Cut 1.25m - 1.5m	1106.92m³	–
	Cut 1.5m - 1.75m	884.80m³	–
	Cut 1.75m - 2m	772.92m³	–
	Cut 2m - 2.25m	681.49m³	–
	Cut 2.25m - 2.5m	571.12m³	–
	Cut 2.5m - 2.75m	415.30m³	–
	Cut 2.75m - 3m	269.73m³	–
	Cut 3m - 3.25m	159.41m³	–
	Cut 3.25m - 3.5m	82.39m³	–
	Cut 3.5m - 3.75m	37.50m³	–
	Cut 3.75m - 4m	23.63m³	–
	Cut 4m - 4.25m	15.11m³	–
	Cut 4.25m - 4.5m	8.42m³	–
	Cut 4.5m - 4.75m	3.96m³	–
	Cut 4.75m - 5m	1.40m³	–
	Cut 5m - 5.25m	0.14m³	–

Total Cut: 20381.08m³
Total Fill: 18125.25m³

Notes:

DESIGN PARAMETERS USED

TOPSOIL - NO TOPSOIL ANTICPATED TO BE STRIPPED

BUILDING FOOTPRINT - FFL PROJECTED DOWN 450mm TO ALLOW FOR 300mm THICK GRANULAR BUILD UP LEFT 150mm BELOW FFL

REMAINDER OF SITE - FINISHED GROUND LEVELS PROJECTED DOWN 400mm TO ROAD AND YARD LEVELS AND 700mm WHERE PERMEABLE PAVING IS PROPOSED.

REV:	DESCRIPTION:	BY:	DATE:

STATUS: FOR APPROVAL

FI CONSTRUCTION

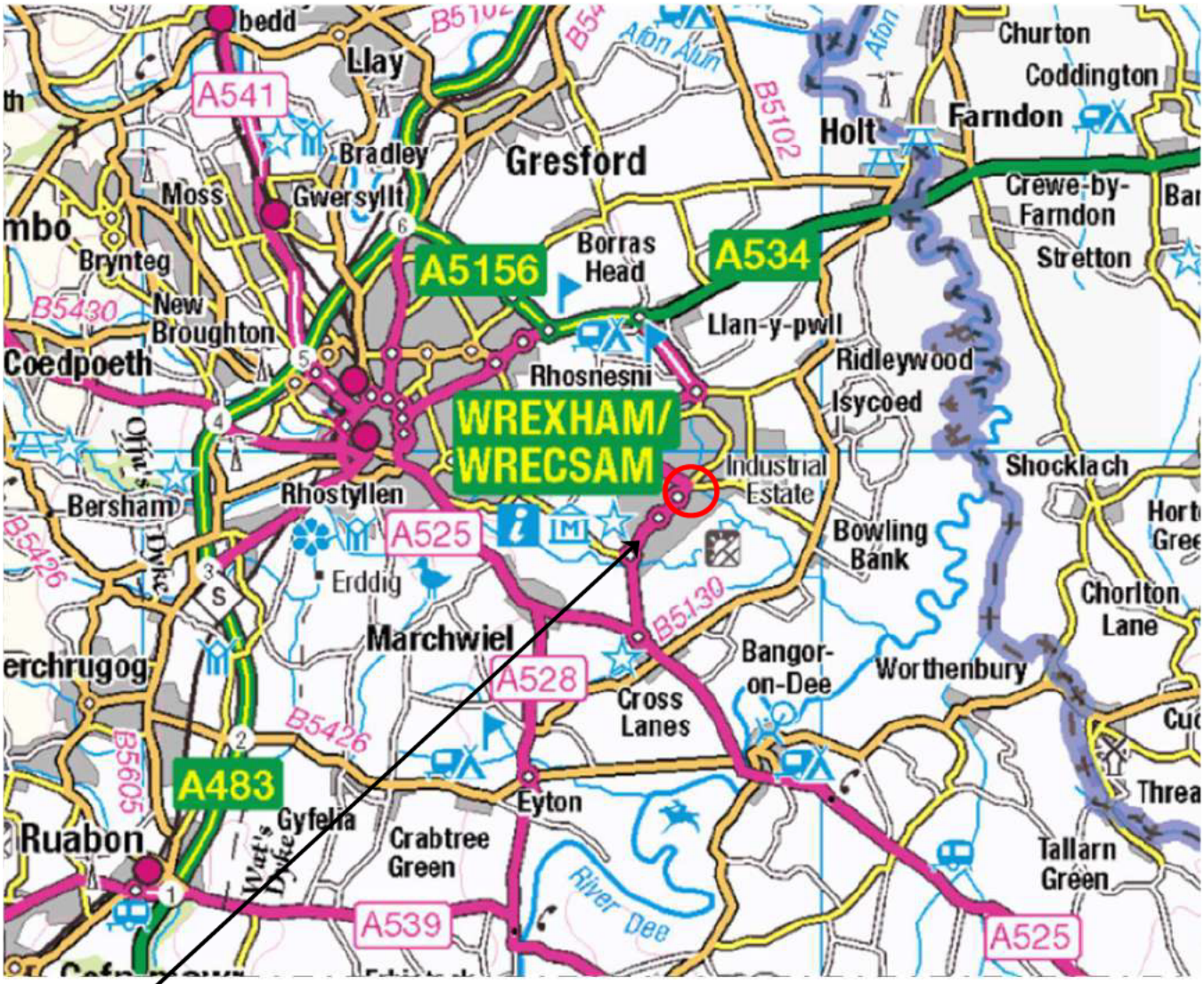
FI Construction
Canal Mill, Botany Brow
Chorley, Lancashire
PR6 9AF

CLIENT: FI Real Estate Management Ltd
Canal Mill, Botany Brow,
Chorley, Lancashire
PR6 9AF

SITE: The Oaks
Oak road, Wrexham

TITLE: Regrade Cut/Fill Plan

SCALE AT A1:	DATE:	DRAWN:	CHECKED:
1:1000	20/03/2025	DTT	
PROJECT NO:	DRAWING NO:		REVISION:
	RCFP01		-



SITE LOCATION

NEAREST POSTCODE: LL13 9RD

SITE ENTRANCE. WHAT THREE WORDS ///ASKED.MARSH.THUMB



REV	DATE	DESCRIPTION	BY	CKD

BROWNFIELD SOLUTIONS

CLIENT
FI CONSTRUCTION

PROJECT TITLE
THE OAKS, WREXHAM

DRAWING TITLE
SITE LOCATION PLAN

DRAWING No.	REVISION	SCALE	DATE
C6668/02	-	NTS	15/04/26

DRAWN BY	CHECKED BY
MO	AJS



KEY	
	FI CONSTRUCTION OWNERSHIP BOUNDARY
	APPROXIMATE SITE BOUNDARY
WS0X	WINDOW SAMPLE BOREHOLE (2026)
TP0X	TRIAL PIT (2025)
WS0X	WINDOW SAMPLE BOREHOLE (2025)
	BOREHOLE INSTALLATION

NOTES

1. ALL DIMENSIONS TO BE CHECKED ON SITE BEFORE COMMENCING WORKS. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ARCHITECT & ENGINEER FOR VERIFICATION. FIGURED DIMENSIONS ONLY ARE TO BE TAKEN FROM THIS DRAWING.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS REPORTS. THIS DRAWING IS COPYRIGHT OF BSL.
3. DRAWING NOT FOR CONSTRUCTION PURPOSES.
4. LOCATIONS OF 2025 SP ASSOCIATES INVESTIGATION TESTS (BH1-5 AND TP1-3) ARE APPROXIMATELY LOCATED BASED ON THEIR HOLE PLAN.

REV	DATE	DESCRIPTION	BY	CKD
-	20/04/26	DRAFT ISSUED AFTER INVESTIGATIONS	CC	AJS
A	14/05/26	REVISED USING NEW DRAWING FILE	CC	AJS

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CLIENT
FI CONSTRUCTION

PROJECT TITLE
THE OAKS, WREXHAM

DRAWING TITLE
EXPLORATORY HOLE PLAN

DRAWING No.	REVISION	SCALE	DATE
C6668/02	A	NTS	14/05/26

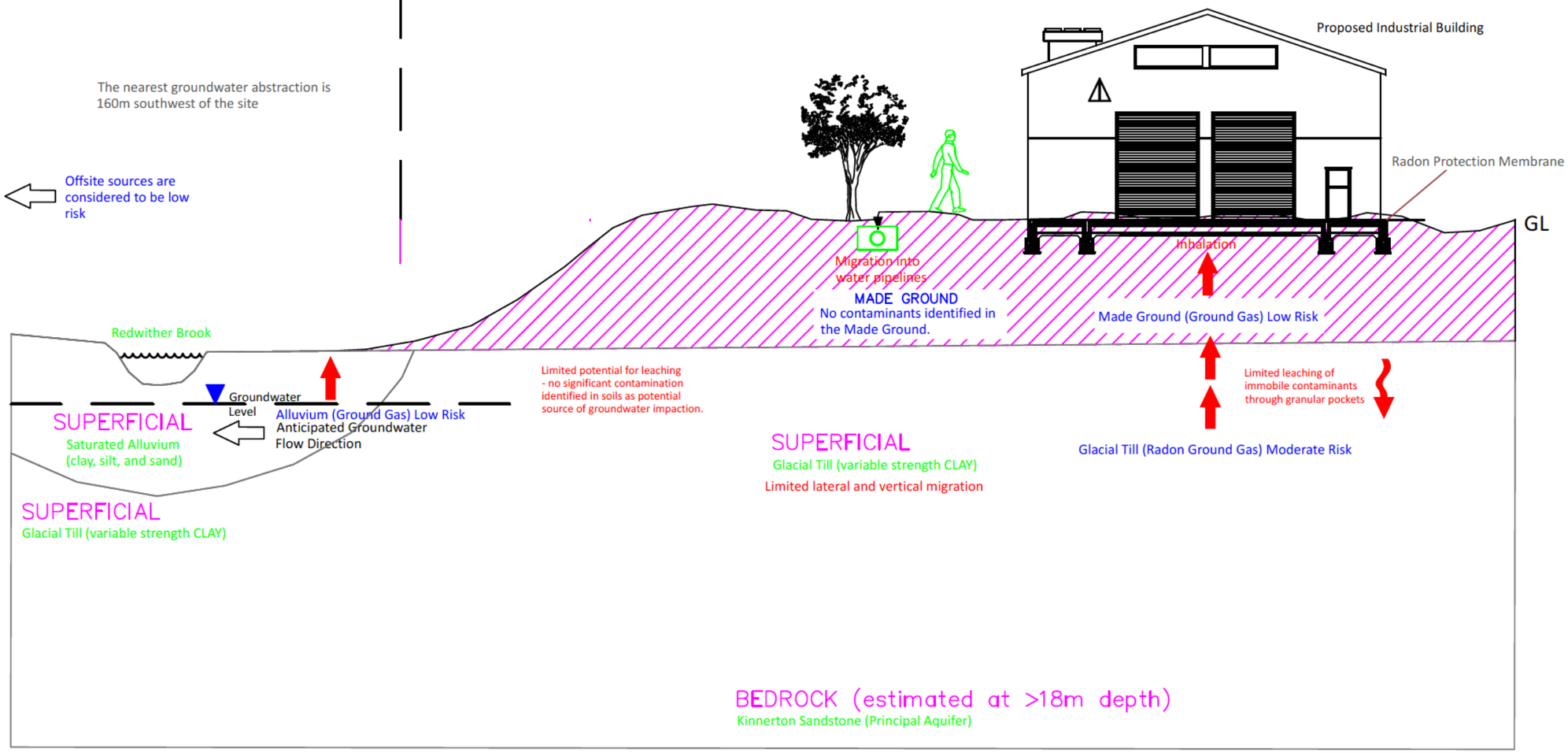
DRAWN BY	CHECKED BY
CC	AJS

OFF-SITE

ON-SITE

The nearest groundwater abstraction is 160m southwest of the site

Offsite sources are considered to be low risk



Key

- Made ground
- Blue For Source
- Red For Pathway
- Green For Receptor
- Strip and Pad Foundations
- Tree

NOTES

1. ALL DIMENSIONS TO BE CHECKED ON SITE BEFORE COMMENCING WORKS. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ARCHITECT & ENGINEER FOR VERIFICATION. FIGURED DIMENSIONS ONLY ARE TO BE TAKEN FROM THIS DRAWING.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS REPORTS. THIS DRAWING IS COPYRIGHT OF BSL.
3. DRAWING NOT FOR CONSTRUCTION PURPOSES.

REV	DATE	DESCRIPTION	BY	CKD

BROWNFIELD SOLUTIONS LTD

CLIENT

FI CONSTRUCTION

PROJECT TITLE

THE OAKS, WREXHAM

DRAWING TITLE

CONCEPTUAL SITE MODEL

DRAWING No.	REVISION	SCALE	DATE
C6668/03	-	NTS	14/05/26

DRAWN BY	CHECKED BY
CC	AJS

APPENDIX A

Chemical Specification for Soils

Quality Control Methodology for Imported and Re-used Soils

Prior to Importation and Re-use

In order to prove soils/materials are chemically suitable for the intended use, reliable testing results should be provided, or samples should be obtained at the source and tested prior to either importation or re-use on site of origin as early as possible.

The frequency and scope of testing will vary depending on the source. The required testing of which for both controlled waters and human health is provided below.

These rates are based on a combination of guidance from the National Contained Land Officers Groupe (NCLOG) "A Regulator's Guide to Cover Systems and their Verification", YALPAG "Verification Requirements for Cover Systems" alongside other similar local authority guidance documents, the professional judgement of BSL and acceptance of similar criteria used on similar sites to the satisfaction of the local regulatory authority. Results should be compared to the acceptance criteria appended.

Material Use	Testing Frequency*	Suite of Analysis						
		1	2	3	4	5	6	7
Topsoil								
Import Greenfield Source	*1 per 100m³	■		■				
Import or Re-use Brownfield/Recycled Source	*1 per 50m³	■		■	■			
Subsoil								
Import Greenfield Source	*1 per 150m³	■		■				
Import or Re-use Brownfield/Recycled Source	**1 per 100m³	■		■	■			
First Generation (i.e. quarried sand)	*1 per 250m³		■					
General Fill* **								
First Generation (i.e. quarried stone)	*1 per 2000m³		■					
Site Generated / Imported 6F Type Material	*1 per 2000m³	■		■	■			
Imported Natural Arisings from another construction site (greenfield)	*1 per 2000m³	■		■				
Imported Natural Arisings from another construction site (brownfield)	**1 per 2000m³	■		■	■			

Notes

1 – BSL Default Suite - *Arsenic, Cadmium, Chromium (total and hex), Copper, Nickel, Mercury, Lead, Zinc, Selenium, speciated polycyclic hydrocarbons (PAH 16), water soluble sulphate (2:1 Extract), soil organic matter and pH.*
2 – BSL Soil Suite A - *Arsenic, Cadmium, Chromium (total and hex), Copper, Nickel, Mercury, Lead, Zinc, Selenium, pH.*
3 – Asbestos ID (and Quantification if detected).
4 – TPH Analysis - *Speciated Total Petroleum Hydrocarbons (TPH CWG) including BTEX and MTBE.*
5 – VOC Analysis - *Volatile Organic compounds (VOCs) by GC-MS (ex TIC).*
6 – SVOC Analysis - *Semi-Volatile Organic compounds (SVOCs) by GC-MS (ex TIC).*
7 – Visual Inspection & on-site screening for VOC using calibrated PID.
* Minimum of 3 samples per source.
** Minimum of 6 samples per source.
***To be used at depths >450mm bgl or below building/hardstanding.
****For imported materials, the scope of testing should be reviewed upon identification of the material site of origin, and additional / alternative suites of testing undertaken, depending on any specific contaminants of concern identified.

The testing should be undertaken at a UKAS accredited laboratory, be MCERTS accredited where available, and all results should be below the remedial target values appended.

Waste Legislation

Prior to the excavation, stockpiling, movement and placement of soils/materials, appropriate exemptions should be in place (e.g. an MMP or other suitable exemption/permit).

Topsoil/Subsoil

For topsoil and subsoil suitability as a growing medium, reference should be made to BS3882:2015 Specification for Topsoil, BS 8601:2013 Specification for Subsoil and requirements for use. These standards should be adopted where feasible, especially for recycled/manufactured soils, but it should be noted that this standard is often difficult to apply to existing greenfield topsoil/subsoil which has shown no prior issue as a growing medium (i.e. no vegetative stress prior to stripping/stockpiling).

In consideration of promoting soils sustainability, a view should be taken on the suitability of topsoil/subsoil if it does not fully comply with the standards and agreed with the LPA. For example, on a site whereby sensitive peat/acid soils are present, but site won topsoil does not comply with the standard, it would potentially be more sustainable and appropriate to retain and re-use such soils as opposed to removal and replacement.

In addition to the above sampling frequencies and testing, all site won and imported topsoil/subsoil should also confirm to the following criteria:

- Have a maximum stone size of 75mm.
- Be clean and free of foreign debris including; building waste materials, anthropogenic material and contaminants e.g. brick, glass, plastic, asbestos, hardcore and plasterboard, etc.

For imported soils, approval should be obtained from the Local Authority prior to importing to site.

Site Won & Imported General Fill and Crushed Hardcore (for use below building/hardstanding only)

In addition to the above sampling frequencies and testing; for the importation or re-use of site won fill or hardcore (class 6 material /imported quarried stone), BSL proposes the following inspection criteria:

- No visual contamination (oil staining etc).
- Limited deleterious material (organics, wood, etc).
- Limited metal.
- No visible asbestos containing material (ACM).
- Quantifiable Asbestos at or <0.001 w/w%.

Production of Grade 6 materials should be done under WRAP quality protocols or similar. Inspections and sampling would need to be carried out by a qualified geo-environmental engineer for all material used as fill. For geotechnical performance, reference should be made to Series 600 Earthworks Guidance.

Any imported material should be tested and visually inspected at source by a relevant third party consultant prior to importation. Approval should be obtained from the Local Authority prior to importing to site. If the DoWCoP is the chosen route, the material should be declared on the MMP by a Qualified Persons (QP) before prior to importation, otherwise excavated soils could constitute an illegal deposit of waste and enforcement action could be taken by the EA and HMRC.

If the above criteria for asbestos is exceeded, then further consideration and assessment will be required. Works would need to be undertaken in compliance with the Control of Asbestos Regulations (CAR) 2012 and an Asbestos Plan of Works may be required.

Post Importation

The imported soils should be visually inspected on site to confirm it is the same material inspected at source and it is suitable for use. Once imported to site, tests should also be undertaken to confirm the batch is suitable prior to use and has not been contaminated in transit.

A management plan should be in place on site for storage and transportation. The material should be stockpiled separately and well segregated on site to prevent cross contamination in accordance with good site practice.

Accurate records of movement of soils should be kept in order to be incorporated in the final verification report.

Approval should be obtained from the Local Authority prior to use on site.

Validation and Verification Report

Site
A final verification report should be issued to the Local Authority/Warranty Provider (e.g. NHBC) detailing records of the re-use and importation of soils, alongside their use on the site.

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Human Health Remediation Targets - Soils			Import based on human health without homegrown produce (1% SOM)	Re-use Criteria based on Human health -Commercial (1% SOM)
Source	Contaminant	Unit		
LQM S4UL	Arsenic	mg/kg	40	640
LQM S4UL	Cadmium	mg/kg	85	190
LQM S4UL	Chromium (III)	mg/kg	910	8600
LQM S4UL	Chromium (VI)	mg/kg	6	33
LQM S4UL	Copper	mg/kg	7100	68000
C4SL	Lead	mg/kg	330	2300
LQM S4UL	Mercury, Elemental	mg/kg	1.2	58
LQM S4UL	Nickel	mg/kg	180	980
LQM S4UL	Selenium	mg/kg	430	12000
LQM S4UL	Zinc	mg/kg	40000	730000
Atkins ATRISK	Cyanide (free)	mg/kg	34	373
LQM S4UL	Phenol (total)	mg/kg	440	440
LQM S4UL	Acenaphthene	mg/kg	3000	84000
LQM S4UL	Acenaphthylene	mg/kg	2900	83000
LQM S4UL	Anthracene	mg/kg	31000	520000
LQM S4UL	Benz(a)anthracene	mg/kg	11	170
LQM S4UL / C4SL	Benzo(a)pyrene	mg/kg	3.2	35
LQM S4UL	Benzo(b)fluoranthene	mg/kg	3.9	44
LQM S4UL	Benzo(ghi)perylene	mg/kg	360	3900
LQM S4UL	Benzo(k)fluoranthene	mg/kg	110	1200
LQM S4UL	Chrysene	mg/kg	30	350
LQM S4UL	Dibenz(a,h)anthracene	mg/kg	0.31	3.5
LQM S4UL	Fluoranthene	mg/kg	1500	23000
LQM S4UL	Fluorene	mg/kg	2800	63000
LQM S4UL	Indeno(1,2,3,cd)pyrene	mg/kg	45	500
LQM S4UL	Naphthalene	mg/kg	2.3	190
LQM S4UL	Phenanthrene	mg/kg	1300	22000
LQM S4UL	Pyrene	mg/kg	3700	54000
LQM S4UL	TPH Aliphatic EC 5 - 6*	mg/kg	42	3200
LQM S4UL	TPH Aliphatic EC 6 - 8*	mg/kg	100	7800
LQM S4UL	TPH Aliphatic EC 8 - 10*	mg/kg	27	2000
LQM S4UL	TPH Aliphatic EC 10 - 12*	mg/kg	130	9700
LQM S4UL	TPH Aliphatic EC 12 - 16*	mg/kg	1100	59000
LQM S4UL	TPH Aliphatic EC 16 - 35*	mg/kg	65000	1600000
LQM S4UL	TPH Aliphatic EC 35 - 44*	mg/kg	65000	1600000
LQM S4UL	TPH Aromatic EC 5 - 7*	mg/kg	370	26000
LQM S4UL	TPH Aromatic EC 7 - 8*	mg/kg	860	56000
LQM S4UL	TPH Aromatic EC 8 - 10*	mg/kg	47	3500
LQM S4UL	TPH Aromatic EC 10 - 12*	mg/kg	250	16000
LQM S4UL	TPH Aromatic EC 12 -16*	mg/kg	1800	36000
LQM S4UL	TPH Aromatic EC 16 - 21*	mg/kg	1900	28000
LQM S4UL	TPH Aromatic EC 21 - 35*	mg/kg	1900	28000
LQM S4UL	TPH Aromatic EC 35 - 44*	mg/kg	1900	28200
LQM S4UL	Benzene	mg/kg	0.38	27
LQM S4UL	Toluene	mg/kg	880	56000
LQM S4UL	Ethyl Benzene	mg/kg	83	5700
LQM S4UL	Xylene - o	mg/kg	88	6600
LQM S4UL	Xylene - m	mg/kg	82	6200
LQM S4UL	Xylene - p	mg/kg	79	5900
CL:AIRE 2010	MTBE (methyl tert-butyl ether)	mg/kg	49	7900
Professional Judgement	Asbestos (No visual ACM)	% w/w	<0.001%	≤0.001
pH	BS3882	pH Units	NA	5 - 8.2

LQM/CIEH S4ULs copyright Land Quality Manangment Limited reproduced with permission; Publication Number S4UL3237. All rights reserved.

Atkins ATRISK Soil SSVs March 2017.

See LQM/CIEH S4ULs for Human Health Risk Assessment and Atkins ATRISK Soil SSVs documents for notes regarding derivation.

Criteria for PAH and TPH assumes a conservative SOM of 1% - adjustmnets may be made for higher SOM where considred appropriate.

*Soil matrix should contain no free product.

All imported material to have chemical concentrations less than the above levels for the site, with the exception of pH which is a range.

Test results to be provided to the engineer prior to placing soils, where appropriate.

All tests result to be undertaken by a UKAS Laboratory holding accrediation for the relevant tests.

Should be read in conjuntion with any asbestos depth re-use CSM where applicable in corresponding Remedial Strategy.

Reviewed July 2024

APPENDIX B

BSL Guidance – Re-use and Disposal of Waste

Re-Use Of Waste - Guidance Note

Definition of Waste
The Environment Agency considers waste to be *"...any material that is discarded, or intended to be discarded..."* This includes any soil from trenches, footing, site strip etc. It is no longer required in its original location, therefore it is considered to be waste.

CL:AIRE: Code of Practice
Where materials are excavated for construction purposes, wherever possible these should be retained on site for engineering purposes if they are suitable for use. This can be implemented under the CL:AIRE "Development Industry Code of Practice for the Definition of Waste" (CL:AIRE DoWCoP), also commonly referred to as a "Materials Management Plan".

The developer/contractor is advised to complete all works under the DoWCoP.

Potential scenarios where soils may be able to be re-used:

- Material capable of being used in another place on the same site without treatment.
- Material capable of being used in another place on the same site following ex-situ treatment on site.
- Material capable of being used in another development site without treatment (Direct Transfer).
- Material capable of being used in another development site following ex-situ treatment on another site eg Hub site.

The Code of Practice requires 4 No. Factors to be addressed:

1. Protection of human health and protection of the environment.
2. Suitability of use, without further treatment.
3. Certainty of use.
4. Quantity of material.

In order to satisfy these requirements the following are required:

i) Consultation/approval with Local Authority & Environment Agency to confirm they have no objections to the proposed re-use of waste soils, or the risk assessments for the site.
ii) Risk Assessments to demonstrate that the site does not present an Environmental Hazard.
iii) Remediation Strategy for contaminated sites (or Design Statement for non-contaminated sites).
iv) Materials Management Plan (MMP) which details material generated stockpiles and the end use.
v) Volume calculations.
vi) Planning permission for the development.
vii) Contractual details to be clear, regarding who steps in is a contractor goes into administration/liquidation.

The use of the CoP is effectively industry regulated, there is a requirement to appoint an independent Qualified Person (QP) who checks all the requirements have been met and registers the documentation with the Environment Agency. This person must not have had any involvement with the preparing of the risk assessments or remedial strategy on the site.
Soils which require treatment on site (eg bioremediation, stabilisation) will require an Environmental Permit for treatment, together with justification and validation to prove, once treated, this material is suitable for use.
Site management procedures need to be in place to ensure that material is tracked through from excavation stockpiling, treatment and remediation processes. Should the process of material tracking be considered non-robust, or not adhered to, this may fail the test whether excavated materials may be considered non-waste.

Alternatives include the EA U1 exemption (soils and stones <1000 tonnes and aggregates <5000 tonnes) and the Waste Framework Directive, which applies to naturally occurring soils used on site of origin only. Aggregates can also fall under the EA WRAP Quality Protocols.

Waste Classification For Soils

Introduction

Waste producers have a duty of care to classify the waste they are producing:

- before it is collected, disposed of or recovered.
- to identify the controls that apply to the movement of the waste.
- to complete waste documents and records.
- to identify suitably authorised waste management options.
- to prevent harm to people and the environment.

The most sustainable and economic method of dealing with waste soil is usually the retention and re-use on site. Where this is not possible there are three main options for the disposal of soils:

1. Disposal to a permitted waste recycling facility.
2. Re-use on another site (subject to the suitability).
3. Disposal to a landfill site.

The disposal to a permitted facility will be subject to the **specific conditions of the permits for each individual facility** and will vary dependent on location and environmental sensitivity of the receiving site. Re-use on another site will also be subject to the acceptability criteria of that site.

The guidance below relates to disposal to **landfill sites only**.

Background for Landfill Disposal

In July 2005 the United Kingdom implemented the European Directive 1999/31/EC (The Landfill Directive), this introduced the current regime for waste and waste disposal to landfill. The Landfill Directive places controls on waste disposal. These controls include requirements to follow the waste acceptance procedures and criteria that have been agreed by the Council of the European Union and are laid out in Council Decision 2003/33/EC.

Before a waste can be accepted at a landfill site, the landfill **operator** must be satisfied that the waste meets his permit conditions, the waste acceptance procedures (WAP) and waste acceptance criteria (WAC).

If disposal to landfill is the best management option for the waste soils, these procedures **must** be followed or the operator may refuse to accept the waste.

Key Points

- Not all waste can be landfilled
- Landfills are classified according to whether they can accept **hazardous, non-hazardous** or **inert** wastes.
- Wastes can only be accepted at a landfill if they meet the waste acceptance criteria (WAC) for that class of landfill.
- Most wastes must be treated before you can send them to landfill.
- There are formal processes for identifying and checking wastes that must be followed before wastes can be accepted at a landfill site.

Classification

Wastes are listed in the European Waste Catalogue (EWC 2002) and grouped according to generic industry, process or waste types. Wastes within the EWC are either hazardous or non-hazardous. Some of these wastes are hazardous without further assessment (absolute entries) or are 'mirror' entries that require further assessment of their hazardous properties in order to determine whether they are hazardous waste.

Waste soil has mirror entries on the EWC and as such the first phase of the waste classification process is that of determining if the waste is hazardous or not i.e the hazard assessment. The most common EWC waste codes related to soil are:

17 05	**soil (including excavated soil from contaminated sites), stones and dredging spoil**
17 05 03*	soil and stones containing dangerous substances
17 05 04	soil and stones other than those mentioned in 17 05 03

Soils may contain certain contaminants (eg asbestos, oil,) which have prescribed concentration thresholds, that if breached will render the material hazardous waste. These are based on specific "hazardous properties" which include hazards such as carcinogenicity, flammability and toxicity.

In the first instance the concentrations of plausible contaminants within the soil should be identified and wastes should be **classified based on their total concentrations.**

Waste Definitions

Inert	• Will not undergo any significant physical, chemical or biological transformations. • Will not dissolve. • Will not burn. • Will not physically or chemically react. • Will not biodegrade. • Will not adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or harm to human health. • Has insignificant total leachability and pollutant content. • Produces a leachate with an ecotoxicity that is insignificant (if it produces leachate).
Non-Hazardous	Is not inert (see above) Is not hazardous (see below)
Hazardous	Soil has hazardous properties as defined in WM3 (Guidance on the classification and assessment of waste (1st edition 2015)- Technical Guidance)
Stable Non-reactive hazardous waste#	Hazardous waste, the leaching behaviour of which will not change adversely in the long-term, under landfill design conditions or foreseeable accidents either: in the waste alone (for example, by biodegradation), under the impact of long-term ambient conditions (for example, water, air, temperature or mechanical constraints) or by the impact of other wastes (including waste products such as leachate and gas).

This option allows hazardous waste that is stable and thus has a low leaching potential to be deposited in cells with a standard of containment consistent with non-hazardous wastes.

WAC Testing

The purpose of WAC analysis is to confirm that the waste complies with the relevant WAC for the receiving landfill. If the waste has any disposal route other than a landfill site (e.g. recycling facility, incineration etc) the **WAC is not relevant.** Furthermore the WAC limits **cannot be used to make an assessment of whether a waste is hazardous**. WAC testing does however define if a non-hazardous waste is suitable for an inert landfill.

Classification based on Total Concentrations[1]	Non-Hazardous Waste		Hazardous Waste	
WAC testing	Below inert WAC limit values:	Above inert WAC limit values:	Below hazardous WAC limit values	Above hazardous WAC limit values
Landfill requirements	INERT landfill	NON-HAZARDOUS landfill[2]	HAZARDOUS landfill	PRE-TREATMENT[3]

1 Total concentrations are defined as tests results on solids as opposed to leachate (i.e. a liquid).
2 Individual sites may have certain limit values pre-determined in their licence.
3 After pre-treatment the material characteristics may have changed to an extent that allow the soil to be re-classified.

Hydrocarbons in Soils

WM3 uses the term Oil or Waste Oil to cover hydrocarbons products such as fuel oil, petrol or diesel. These are defined by WM3 as hazardous under an absolute entry in the List of Wastes. However hydrocarbons in soils are a mixture rather than a pure product and are therefore not absolute entries.

Known Oils

The simplest scenario is where the identity of the contaminating oil is known or can be identified. If the oil is known the manufacturer's or supplier's REACH compliant safety data sheet for the specific oil can be obtained and the hazard statement codes on that Safety Data Sheet can be used for the hazardous waste assessment.

Where the identity of the oil can only be identified down to a petroleum group level (i.e. the contaminating oil is known to be diesel, but the specific type/brand is unknown), then the classification of that petroleum group should be used in the assessment. The marker compounds associated with that petroleum group may be used to confirm carcinogenicity.

Oils may contain a range of hydrocarbons, so the presence of for instance Diesel Range Organics (DRO) does not enable the assessor to conclude that diesel is present. These hydrocarbons may have arisen from other oils, the laboratory needs to provide an interpretation of the chromatograph to determine if it is consistent with diesel or weathered diesel as a whole.

The concentration of known oils should be determined using a method that as a minimum spans the range in which the carbon numbers for that known oil fall.

Unknown Oils

Where hydrocarbons are contaminating soils it is likely that the oil will be unknown or cannot be determined.

WM3 states that:

> For contaminated land specific consideration must be given to the following before proceeding;
>
> - The presence of other organic contaminants, for example solvents or coal tar that could be detected as hydrocarbons. Coal Tar is not an oil and is considered separately in WM3 example 2. Where the site history or investigation indicates the presence of hydrocarbons from oil and other sources (e.g. coal tar), and the origin of the hydrocarbons cannot reliably be assigned to either, then a worst case approach of considering the hydrocarbons both as waste oil (in accordance with this example) and from other sources, for example coal tar should be taken.
> - The presence of diesel, or weathered diesel, should be specifically considered by the laboratory and where this is confirmed by the hydrocarbon profile the oil should be assessed as a known or identified oil (diesel).

The use of **marker compounds** is optional; however it is recommended that where possible the marker compounds should be used. WM3 states:

> If the identity of the oil is unknown, and the petroleum group cannot be established, then the oil contaminating the waste can be classified as non-carcinogenic/mutagenic due to the presence of oil if all three of the following criteria are met:
>
> - The waste contains benzo[a]pyrene (BaP) at a concentration of less than 0.01% (1/10,000th) of the TPH concentration (This is the carcinogenic limit specified in table 3.1 of the CLP for BaP)
> - This has been determined by an appropriate and representative sampling approach in accordance with the principles set out in Appendix D of WM3, and
> - The analysis clearly demonstrates, for example by carbon bands or chromatograph, and the laboratory has reasonably concluded that the hydrocarbons present have not arisen from petrol or diesel.

For example:

TPH Concentration (mg/kg)	Petrol or Diesel	BaP (mg/kg)	Classification
10,000	No	0.9	Non- Hazardous
1,000	No	Not available	Hazardous
1,000	Yes	Not relevant	Hazardous

References

1. Environmental Permitting (England and Wales) Regulations 2010 (as amended) (EP Regulations), the Landfill Directive (1999/31/EC) and the subsequent Council Decisions.
2. Environment Agency Environmental Permitting Regulations: "Inert Waste Guidance- Standards and Measures for the Deposit of Inert Waste on Land" 2009.
3. Environment Agency "Waste acceptance at landfills - Guidance on waste acceptance procedures and criteria" Nov 2010.
4. Environment Agency "Guidance on the classification and assessment of waste (Technical Guidance WM3)".
5. Classification, Labelling and Packaging of Substances Regulation (EC 1272/2008) (CLP).
6. Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives
7. 2014/955/EU: Commission Decision of 18 December 2014 amending Decision 2000/532/EC on the list of waste pursuant to Directive 2008/98/EC of the European Parliament
8. Environmental Permitting Guidance The Landfill Directive For the Environmental Permitting (England and Wales) Regulations 2010 Updated March 2010 Version 3.1
9. Classification, Labelling and Packaging of Substances Regulation (EC 1272/2008) (CLP).

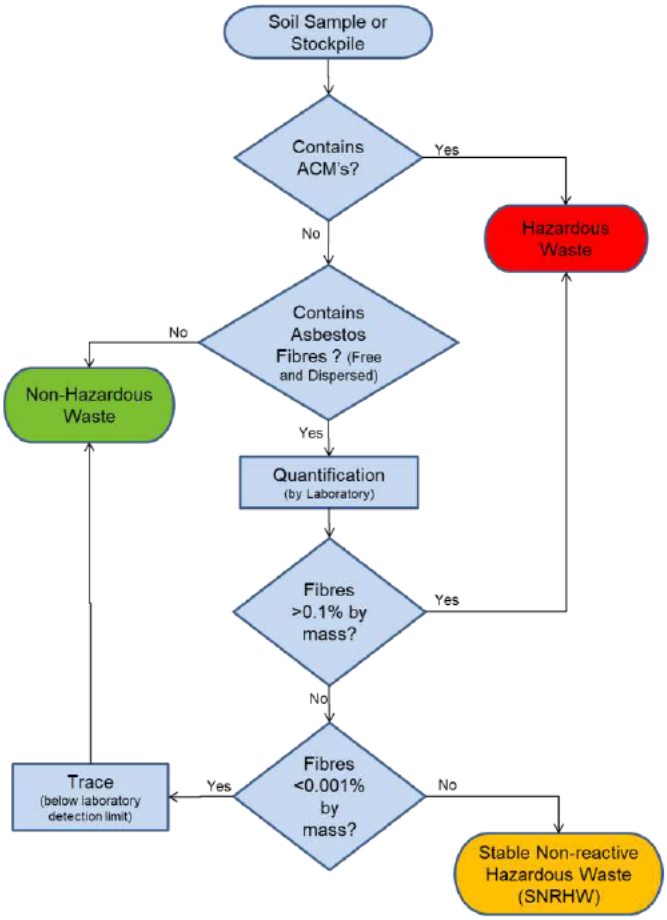
Additional Asbestos Guidance Notes

Disposal

The 1st Edition of WM3 "Guidance on the classification and assessment of waste", details the way in which Asbestos is assessed within soils.

The assessment of asbestos containing waste is dependent on whether the asbestos is present as:

- Fibres that are free and dispersed, or
- Identifiable pieces of asbestos containing materials (ACM's)



Identifiable pieces of asbestos are any particle of a size that can be identified as potentially being asbestos by a competent person if examined by the naked eye. The result is that commonly soils with visible ACM's are sorted and the ACM's removed by hand picking and separate disposal.

Asbestos concentrations below 0.001% by mass are below standard laboratory detection limits and are not currently regarded as containing asbestos for the purposes of disposal and may be disposed of to an inert landfill site[1]. These levels are often termed "trace" by laboratories.

Asbestos concentrations between 0.001% and 0.1% are stable non-reactive hazardous waste (SNRHW)[1]. Waste transfer stations where soil recycling takes place may be able to take SNRHW, but are unlikely to take soils containing asbestos above trace concentrations.

The following codes should be assigned to the asbestos waste as appropriate:

17 06	**Insulation materials and asbestos-containing construction materials**
17 06 01	Insulation materials containing asbestos
17 06 03	Other insulation materials consisting of or containing hazardous substances
17 06 04	Insulation materials other than those mentioned in 17 06 01 and 17 06 03
17 06 05	Construction material containing asbestos

WM3 indicates that 17 06 05 would normally be used in preference to 17 06 01 for the asbestos in asbestos contaminated soil and stones.

Construction materials containing asbestos and "*other suitable materials*" may be landfilled at landfills for non-hazardous waste in accordance with the Landfill Directive without testing.

This means that wastes that are only hazardous because of their asbestos content can be disposed of at landfills for non-hazardous waste in separate landfill cells that only accept asbestos wastes and other suitable materials. The Landfill Directive requires that stable non-reactive hazardous waste shall not be deposited with biodegradable waste (for example organic material, household waste, paper etc..) and must meet the waste acceptance criteria set out in accordance with Annex II.

Construction

Health and Safety Executive (HSE) guidance on asbestos is not directly related to soil and much of the guidance focuses on the removal of asbestos from buildings. The overarching legislation is the Control of Asbestos Regulation (CAR 2012). However where work involves (or is likely to involve) contact with asbestos then CAR 2012 requires a risk assessment including whether or not the work is licensed or notifiable non-licensed work and may require an Asbestos Management Plan. Work becomes notifiable if it is considered that the control limit could be exceeded.

Brownfield sites frequently have soils that contain asbestos and the presence of asbestos needs to be considered within the context of construction, particularly in relation to groundworks. The exposure of soils and the use of excavators and plant to move soil around increases the possibility of fibres becoming airborne. However it is good site practice to not generate dusts and to employ dust suppression on all sites regardless of the presence of asbestos.

The legal control limit for asbestos is 0.1f/ml over a continuous four hour period. The control limit is not a '*safe*' level and exposure from work activities involving asbestos must be reduced to as far below the control limit as possible.

Clearly the higher the concentrations in the soil the greater potential there is for fibres to be released, however IOM publication TM/88/14 "the release of dispersed asbestos fibres from soil" 1988 concludes that:

- Mixtures of asbestos in dry soils with asbestos content as low as 0.001% can produce airborne respirable asbestos concentrations greater than 0.1f/ml in dust clouds where the respirable dust concentrations are less than 5mg/m^3.
- An action limit is recommended of no higher than 0.001% asbestos in soils above which steps should be taken to minimise exposure to airborne fibres (eg by wetting).
- The addition of relatively small quantities (10%) of water can reduce the airborne fibre concentrations by an order of magnitude.

Where asbestos has been identified at concentrations above 0.001% as free and dispersed fibres in the soil precautions need to be adopted. Concentrations below this are considered to be normal background, although good site practice dictates that the generation of dusts should be avoided and therefore any fugitive fibre release from minor concentrations should be kept to a practical minimum.

End Use

The use of materials containing asbestos and material containing asbestos is prohibited under EU legislation. There is currently a Joint Industry Working Group (JIWG) tasked with producing a Code of Practice for Asbestos in Soil, Made Ground and Construction & Demolition Material that will clarify in due course the position of the various government agencies.

Asbestos containing materials can remain in situ under a suitable cover system which may be hardsurfacing or soft landscaping (with or without hard dig layers and markers).

There is a risk that future maintenance may compromise such systems and details of the presence of asbestos should be kept in the Health and Safety File.

Preliminary publications from JIWG (April 2015) provide guides for decision making in relation to construction. These are at a "Beta" test stage and further publications will be provided in due course.

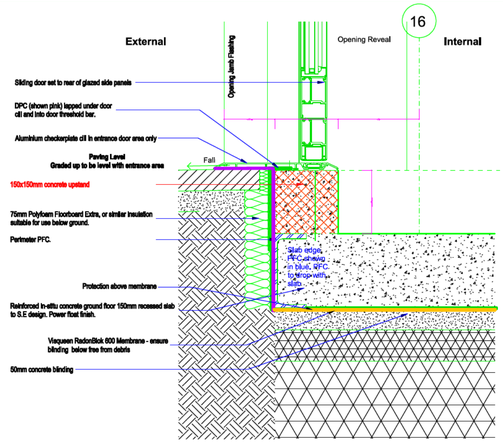
The re-use of waste soils should be undertaken in accordance with the CL:AIRE Code of Practice and is subject to suitable risk assessments demonstrating low risk . There is nothing that specifically excludes the re-use of soils containing asbestos as fill to raise levels. However the movement of materials increases the risk of fibres becoming airborne and suitable precautions will be required.

The re-use of soils containing asbestos at concentrations above hazardous waste levels is likely to meet with regulatory opposition. Assuming a suitable strategy could be agreed this would take a considerable amount of time and is only likely to be feasible where there is a long program for implementation.

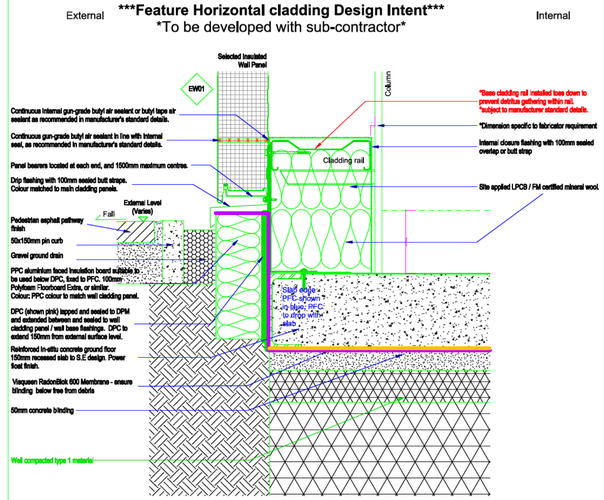
APPENDIX C

Radon Protection System Details

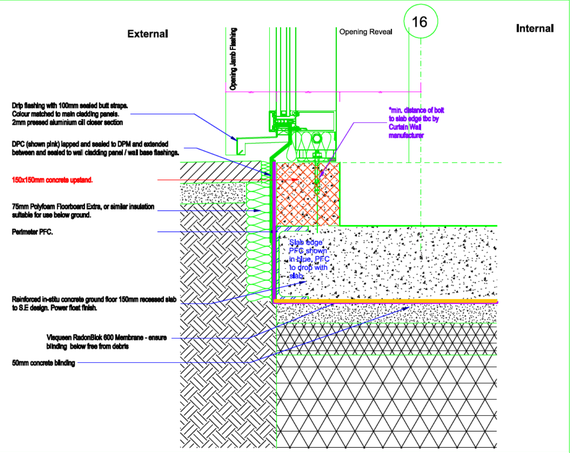
Typical Curtain Wall Opening - 150mm Upstand Door Cill Detail



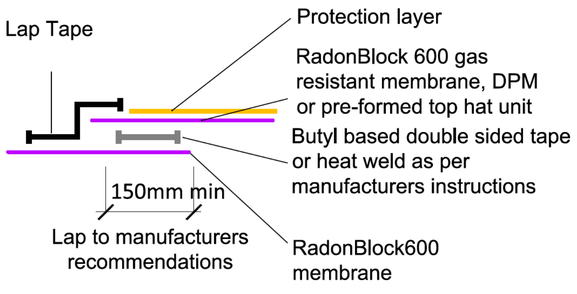
Typical Office Base Detail - Horizontal Cladding Recessed Slab



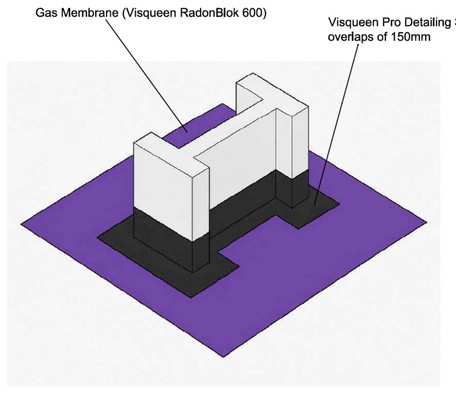
Typical Curtain Wall Opening - 150mm Upstand Cill Detail



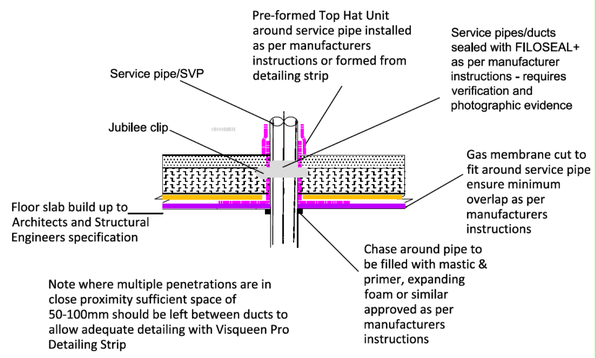
Typical Membrane Lap Details



Typical Stanchion Detail



Typical Service Penetration Detail



NOTES

1. This drawing is in general accordance with current best practice with respect to design of measures and specification of membranes for the adequate protection of structures from the ingress of harmful ground gases. The details contained on this drawing are for guidance purposes only. Any proposed amendments to the detail due to variations on specific structure types should be referred back to BSL the Local Protection Authority for review and approval prior to implementation on site.
2. Floor slab buildup to Architect and Structural Engineer design. The gas membrane is to be installed as per manufacturers guidance.
3. Foundations designed by others. Foundation designer to note the requirements of this drawing and the requirements of the Architect. For details of proposed foundations refer to site specific foundation plan and site investigation report.
4. This drawing was prepared for the purpose stated. New products, improved practices and legislation may necessitate an alteration to this drawing in whole or part after its submission.
5. Verification should be undertaken by an independant Consultant in accordance with: CIRIA 735 and the verfication plan set out within the BSL Remedial Strategy Ref JMC/M3957/8167 Rev A Dated January 2019.
6. BSL take no responsibility for the inappropriate use of this detail on a development.

MEMBRANE MUST BE INDEPENDENTLY VERIFIED IN ACCORDANCE WITH BRE211 AND CIRIA C735

ANY DAMAGE TO MEMBRANES MUST BE REPORTED, RECTIFIED AND RE-VERIFIED

TO BE USED IN CONJUNTION WITH STRUCTURAL ENGINEER AND ARCHITECT DRAWINGS - ENSURE LATEST REVISION

Legend

N 4194xxxxx
E 3589xxxxx — coordinates are to centre of structural column or corner of external wall.

1500 — orange lines denote slab edge at sectional overhead doors without PFC

1500 — gridline dimensions shown in blue

150mm recessed Ground Floor slab
250mm recessed First Floor slab

Slab edge

Recessed slab edge

1500 — Internal upstand in board of PFC. Upstand face to abut insulated panel

1500 — Balcony upstand

Visqueen RadonBlock600

Suggested Product List

1. Visqueen RadonBlock600
2. Visqueen RadonBlock Double Sided Tape
3. Visqueen Tophat Units
4. Visqueen NF15 Lap Tape
5. Visqueen Pro Detailing Strip 300mm wide
6. Visqueen Treadguard300 protection
7. Filoseal+ Duct Seal
8. Jubilee Clips (adequate sizing for service entry diameters)

NOTES

1. ALL DIMENSIONS TO BE CHECKED ON SITE BEFORE COMMENCING WORKS. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ARCHITECT & ENGINEER FOR VERIFICATION. FIGURED DIMENSIONS ONLY ARE TO BE TAKEN FROM THIS DRAWING.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS REPORTS. THIS DRAWING IS COPYRIGHT OF BSL.

REV	DATE	DESCRIPTION	BY	CKD

BROWNFIELD SOLUTIONS LTD

CLIENT: FI CONSTRUCTION

PROJECT TITLE: THE OAKS, WREXHAM

DRAWING TITLE: INDICATIVE RADON PROTECTION SYSTEM

DRAWING No.	REVISION	SCALE	DATE
C6668/04	-	NTS	06/05/26

DRAWN BY	CHECKED BY
AJS	DMG

Technical Datasheet

Visqueen RadonBlok 600

Features & benefits

- Agrement certified - third party accreditation
- Complies with NHBC Foundation's NF94 guidance for radon protection in Type A, Type B and Type C membrane locations
- Conforms to BR 211:2023 - industry guidance for radon protection
- Also provides damp proof membrane protection
- Dual jointing methods - lap joints can be taped or heat welded

Product description

Visqueen RadonBlok 600 is a flexible 0.6mm thick thermoplastic membrane. The product is purple in colour and supplied 2m x 25m in a single wound roll (not folded).

The membrane is manufactured from virgin polymer.

Approvals and standards

- Third party accreditation (IAB certificate 05/0214)
- Complies with NHBC Foundation's NF94 guidance for radon protection in Type A, Type B and Type C membrane locations
- Conforms to the specification requirements of BR 211:2023
- UKCA UKNI CE to EN 13967:2017
- Visqueen certified with Quality Management System ISO 9001:2015
- Visqueen certified with Occupational Health and Safety System ISO 45001:2018
- Visqueen certified with Environmental Management System ISO 14001:2015

Usage

Visqueen RadonBlok 600 is used to prevent the ingress of radon in both basic and full radon protection areas. The membrane can be positioned within the ground floor construction either above or below the structural floor.

Radon protection – NHBC NF94 guidance:
Visqueen RadonBlok 600 when installed with either taped or welded joints complies with NHBC Foundation's NF94 publication, Hazardous ground gas - an essential guide for housebuilders, in Type A membrane locations. The membrane also complies with this guidance when installed with welded joints in Type B and Type C membrane locations. For further information, contact Visqueen Technical Office.

The product is not intended for use where there is a risk of hydrostatic pressure.

System components

- VisqueenPro Detailing Strip, 300mm x 10m
- VisqueenPro Single Sided Tape, 75mm x 25m
- Visqueen Top Hat Units
- Visqueen RadonBlok Double Sided Tape, 30mm x 30m
- Visqueen Radon Sump
- Visqueen NF-Detailing Strip, 300mm x 10m
- Visqueen NF-150 Lap Tape, 150mm x 10m

Storage and handling

Visqueen RadonBlok 600 should be stored horizontally, under cover in its original packaging.

Care should be taken when handling the product in line with current manual handling regulations.

Preparation

Visqueen RadonBlok 600 should be installed on a smooth continuous surface e.g. grouted beam and block floor, a compacted blinding layer e.g. 50mm thick sand blinding, or smooth concrete blinding. The substrate should be free from irregularities such as voids or protrusions.

The membrane can be cut with a sharp retractable safety knife or robust scissors.

When installing the membrane in demanding site conditions, use Visqueen NF-150 Lap Tape in place of VisqueenPro Single Sided Tape.

Installation

Visqueen RadonBlok 600 should be loose laid on the substrate. The membrane should be clean and dry at the time of jointing. It should be overlapped by at least 150mm, bonded with Visqueen RadonBlok Double Sided Tape and sealed with VisqueenPro Single Sided Tape. Alternatively lap joints can be heat welded to achieve an effective seal. The overlap in the barrier is typically 100mm and when hand welding, a 35mm weld is normally achieved. When

Heanor Gate Road, Heanor, Derbyshire, DE75 7RG
+44 (0) 333 202 6800 I enquiries@visqueen.com I www.visqueen.com

Visqueen RadonBlok 600

hand welding, a roller must be used.

Airtight seals should be formed around all service entry points. Visqueen Preformed Top Hat Units should be used for sealing service entry pipes. The base of the top hat and the upstand should be bonded using Visqueen RadonBlok Double Sided Tape and sealed with VisqueenPro Single Sided Tape. The upstand should be secured with the supplied jubilee clip. Alternatively VisqueenPro Detailing Strip or Visqueen NF-Detailing Strip can be used to seal service entry points. The upstand should be secured with a jubilee clip.

Forming an effective barrier to radon may give rise to complex three-dimensional detailing where, it is recommended Visqueen Preformed Units are used e.g. corners. Alternatively VisqueenPro Detailing Strip or Visqueen NF-Detailing Strip can be used to seal awkward junctions.

If the membrane is punctured or perforated a patch of the same material should be lapped at least 150mm beyond the limits of the puncture and bonded with Visqueen RadonBlok Double Sided Tape and sealed with Visqueen Pro Single Sided Tape. Alternatively a patch can be formed using VisqueenPro Detailing Strip or Visqueen NF-Detailing Strip and lapped at least 150mm beyond the extents of the puncture.

Long periods of exposure to ultraviolet light will reduce the effectiveness of the membrane. The membrane should be covered by a protective layer immediately after installation to prevent damage from following trades, ultraviolet light, etc. 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 membrane the wire reinforcements and spacers must be prevented from puncturing the membrane. Where there is a high risk of potential damage, the membrane should be covered with Visqueen TreadGUARD protection, screed, or other approved protection material before positioning the reinforcement.

When used in full radon protection areas, a Visqueen Radon Sump or subfloor ventilation system maybe required.

Usable temperature range

When taping joints, it is recommended that Visqueen RadonBlok 600 and all associated system components should not be installed below 5°C.

Additional information

Where ground gas protection is required to BS 8485:2015 + A1:2019, use Visqueen Gas Barrier or Visqueen Gas Barrier NF-400 systems.
To assist build sequencing, Visqueen Zedex CPT DPC is available for radon protection through the wall constructions.

For additional detailing information, contact Visqueen Technical Services +44 (0) 333 202 6800.

The information in this datasheet was correct at the time of publication. It is the user's responsibility to obtain the latest version of the datasheet as it is updated on a regular basis. The information contained in the latest datasheet supersedes all previously published editions.

Property	Test method	Units	Compliance criteria	Result
Length	BS EN 1848-2	m	-1	25
Width	BS EN 1848-2	m	-1	2
Straightness	BS EN 1848-2	-	Pass/Fail	Pass
Thickness	BS EN 1849-2	mm	-1	0.6
Tensile strength - MD	BS EN 12311	N/mm²	MDV	15
Tensile strength - CD	BS EN 12311	N/mm²	MDV	15
Tensile elongation - MD	BS EN 12311	%	MDV	400
Tensile elongation - CD	BS EN 12311	%	MDV	400
Joint strength	BS EN 12317-2	N	MLV	400
Watertightness to 2kPa for 24 hours	BS EN 1928	-	Pass/Fail	Pass
Resistance to impact	BS EN 12691	mm	MDV	200
Durability (artificial ageing)	BS EN 1296 and BS EN 1928	-	Pass/Fail	Pass
Durability chemical resistance	BS EN 1847	-	Pass/Fail	Pass

Heanor Gate Road, Heanor, Derbyshire, DE75 7RG
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Visqueen RadonBlok 600

Resistance to tearing (nail shank) MD	BS EN 12310-1	N	MDV	345
Resistance to tearing (nail shank) CD	BS EN 12310-1	N	MDV	340
Water vapour transmission - resistance	BS EN 1931	MNs/g	MDV	1188
Water vapour transmission - permeability	BS EN 1931	g/m²/d	MDV	0.12
Diffusion equivalent air layer thickness	BS EN 1931	m	MDV	238
Low temperature flexibility	BS EN 495-5	°C	MDV	-25
Radon Transmission Rate	SP test method	m²/s	MDV	5.7 x 10^{-12}
Methane gas transmission rate	ISO 15105-1	ml/m²/day/atm	MDV	300
Visible defects	BS EN 1850 -2	-	Pass/Fail	Pass
Reaction to fire	BS EN 13501-1	Class	MDV	E

Health and safety information

Refer to the Visqueen RadonBlok 600 safety datasheet (SDS).

About Visqueen

Visqueen is a leading provider of construction membrane technologies and design-based solutions for ground gas, structural waterproofing, damp proofing and fire protection.

We offer complete support at every stage of the specification, including the supply chain process. As the UK's principal technical authority, we are best placed to ensure that the principal designer and contractor specify the most technically suited, durable, and competitive solution to guarantee their project is protected for the lifetime of the building.

Visqueen is at the forefront of advanced membrane technology and innovation in the construction industry, earning the trust and loyalty of specifiers throughout the UK and Europe.

For more information, visit visqueen.com or contact our sales office at +44 (0) 333 202 6800 or enquiries@visqueen.com

Complete Range, Complete Solution



Visqueen Technical Support

Visqueen offer a comprehensive full nationwide technical support. Our team of CSSW qualified technical support managers provide on site design-based solutions for specifiers, contractors and builders merchants, and will ensure that from design stage to installation the project is fully risk assessed and the specification is approved by all stakeholders.

Our Technical Office, can design, prepare and manage CAD detailing, together with assisting in quantity take offs, while offering advice on technical installations and product selection.

Competency & Design

Visqueen promotes competency in building design by ensuring that its technical team possesses the necessary skills, knowledge, experience, and ethical practices. The company adopts the "golden thread of information," ensuring all project data is digitally secure and accessible throughout a building's lifecycle. This approach aligns with the Building Safety Act and aims to foster accountability and compliance with evolving regulations, providing clients with confidence in the safety and reliability of their projects.

Visqueen CPD Seminars

Visqueen's CPD Seminars offer insights into Building Regulations, Standards, and industry guidance related to damp proofing, hazardous ground gas protection, and structural waterproofing. These one-hour seminars are tailored for construction design professionals and delivered by our Technical Support Managers. Visit our website

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Visqueen RadonBlok 600

to book a free CPD.

Visqueen Contract Design Services

Visqueen Contract Design Services offers a bespoke design service led by our team of Certified Surveyors in Structural Waterproofing (CSSW), providing experienced and specialised waterproofing design expertise for complex projects. We provide comprehensive support throughout the entire project, ensuring that all work meets the requirements of warranty providers and adheres to the highest standards of quality, reliability and current legislation.

Visqueen Training Academy

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Technical Datasheet

Visqueen NF-150 Lap Tape, 150mm x 10m

Features & benefits

- BDA Agrement Certified jointing system - third party accreditation
- Provides an overlap seal to Visqueen gas protection membranes
- Joint integrity - reduces the risk of poured concrete entering the lap joint

Product description

Visqueen NF-150 Lap Tape is a single sided overlap tape consisting of a white coloured polymer carrier film coated with a grey coloured cold weather butyl adhesive protected with a release film.

The product is supplied in roll form 150mm x 10m.

To be used in conjunction with the appropriate Visqueen double sided tape.

Approvals and standards

- Third party accreditation (BDA Agrement Certificate BAB-24-340-P-A-UK)
- Visqueen certified with Quality Management System ISO 9001:2015
- Visqueen certified with Occupational Health and Safety System ISO 45001:2018
- Visqueen certified with Environmental Management System ISO 14001:2015

Usage

When forming taped lap joints in Visqueen gas resistant membranes, joints should be bonded with the appropriate Visqueen double sided tape and then sealed with the appropriate Visqueen single sided tape.

Visqueen NF-150 Lap Tape is a single sided tape specifically designed for sealing lap joints in the following Visqueen gas resistant membranes:
- Visqueen Gas Barrier NF-400
- Visqueen Ultimate Gas Barrier NF-500
- Visqueen Ultimate Gas Barrier NF-600

Storage and handling

Store in dry and clean environment in its current packaging. The tape should not be exposed to long periods of ultraviolet light.
Care should be taken when handling the product in line with current manual handling regulations.
For ease of installation, during hot weather conditions (>25°C), it is recommended to store the tape in a cool location prior to use.

Preparation

The gas resistant membrane joint surfaces should be clean, dry and free from contamination such as dust or sand. Ensure the surface is not water logged. Avoid areas of unsupported jointing.

The tape can be cut with a sharp retractable safety knife.

Hand rollers are required during application. Typical hand rollers include 40mm silicone pressure roller and 6mm brass penny pressure roller.

Installation

Apply appropriate Visqueen double sided tape to the gas resistant membrane lap area and remove release paper. Overlap adjoining membrane in accordance with the installation section of the membrane datasheet. Seal the membrane lap edge with Visqueen NF-150 Lap Tape applied equidistant over the lap edge.

Apply pressure to the jointed area using a roller to ensure a full bond is achieved.

Usable temperature range

It is recommended that the tape should be installed above -5°C. Prior to installation, ensure that frost or ice is not present on the substrate.

Additional information

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Technical Datasheet

Visqueen NF-150 Lap Tape, 150mm x 10m

Property	Value
Dimensions	150mm x 10m
Adhesive type	Cold weather butyl
Application temperature range	-5°C to 40°C

Health and safety information

Please refer to Visqueen NF-150 Lap Tape safety datasheet (SDS).

About Visqueen

Visqueen is a leading provider of construction membrane technologies and design-based solutions for ground gas, structural waterproofing, damp proofing and fire protection.

We offer complete support at every stage of the specification, including the supply chain process. As the UK's principal technical authority, we are best placed to ensure that the principal designer and contractor specify the most technically suited, durable, and competitive solution to guarantee their project is protected for the lifetime of the building.

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Our Technical Office, can design, prepare and manage CAD detailing, together with assisting in quantity take offs, while offering advice on technical installations and product selection.

Competency & Design

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Visqueen NF-150 Lap Tape, 150mm x 10m

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Technical Datasheet

Visqueen NF-Detailing Strip, 300mm x 10m

Features & benefits

- BDA Agrement Certified detailing material - third party accreditation
- Flexible - can be cut and shaped to various applications
- Multi-use - suitable for complicated junctions, stanchions, patchwork and terminations
- Gas resistant non foil self adhesive detailing membrane

Product description

Visqueen NF-Detailing Strip is a single sided strip, consisting of a white coloured polymer carrier film coated with a grey coloured cold weather butyl adhesive compound protected with a release film. It is available in roll format, 300mm x 10m.

Approvals and standards

- BDA Agrement Certified detailing material - third party accreditation
- Complies with the methane gas transmission rate, mass per unit area and thickness requirements of BS 8485:2015 + A1:2019 -
- industry standard for methane and carbon dioxide protection
- Suitable for all Characteristic Gas Situation (CS) ground gas regimes
- Conforms to the specification requirements of NHBC Amber 1 and Amber 2 applications
- Conforms to the specification requirements of BR 211:2023
- Visqueen certified with Quality Management System ISO 9001:2015
- Visqueen certified with Occupational Health and Safety System ISO 45001:2018
- Visqueen certified with Environmental Management System ISO 14001:2015

Usage

Visqueen NF-Detailing Strip is used for sealing junctions and complicated detailing in Visqueen gas protection systems, waterproofing systems, and damp proofing systems. It can be used on concrete, blockwork, brickwork, particle boards, steel work, steel stanchions and wooden substrates for both vertical and horizontal application.

Storage and handling

Store in dry and clean environment in its current packaging. The product should not be exposed to long periods of ultraviolet light.

Care should be taken when handling the product in line with current manual handling regulations.

For ease of installation, during hot weather conditions (>25°C), it is recommended to store the product in a cool location prior to use.

Preparation

Surfaces must be smooth and free from sharp protrusions, ensure the surface and working area is not water logged and is frost free. When applying to blockwork or brickwork the joints must be flush pointed. Prior to bonding, substrates such as masonry, concrete and steel should be primed using Visqueen HP Tanking Primer and allowed to dry thoroughly. Visqueen HP Tanking Primer must not be used on Insulation or ICF systems.

Visqueen NF-Detailing Strip can be cut with a sharp retractable safety knife.

Hand rollers are required during application. Typical hand rollers include 40mm silicone pressure roller and 6mm brass penny pressure roller.

Installation

Position and peel back the Visqueen NF-Detailing Strip release film and apply the pressure sensitive, self adhesive grey face to the prepared substrate. Apply pressure by rollering to ensure a full bond is achieved.

All lap joints should be a minimum of 150mm and must be pressed and rolled to ensure damp, gas or waterproofing continuity.

When used for sealing membranes punctures, Visqueen NF-Detailing Strip should be lapped at least 150mm beyond the extents of the puncture.

Usable temperature range

It is recommended that Visqueen NF-Detailing Strip should be installed above -5°C. Prior to installation, ensure that frost or ice is not present on the substrate.

For ease of installation, during hot weather conditions (>25°C), it is recommended to store the product in a cool location prior to use.

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Visqueen NF-Detailing Strip, 300mm x 10m

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Property	Value
Widths	300mm
Length	10m
Application temperature range	-5°C to 40°C

Health and safety information

Refer to the Visqueen-NF Detailing Strip safety datasheet (SDS)

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Visqueen NF-Detailing Strip, 300mm x 10m

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Technical support: +44 (0) 333 202 6800
Date Published: 19-Feb-2026
Version: 26050

VisqueenPro Detailing Strip, 300mm x 10m

Features & benefits

- Flexible - can be cut and shaped to various applications
- Multi-use - suitable for complex junctions, stanchions, patchwork and terminations
- Gas resistant aluminium core

Product description

VisqueenPro Detailing Strip is a composite of PET/aluminium and a cold weather butyl compound. It is available in roll format, 300mm x 10m.

Approvals and standards

- Complies with the methane gas transmission rate, mass per unit area and thickness requirements of BS 8485:2015 + A1:2019 - industry standard for methane and carbon dioxide protection
- Suitable for all Characteristic Gas Situation (CS) ground gas regimes
- Conforms to the specification requirements of NHBC Amber 1 and Amber 2 applications
- Conforms to the specification requirements of BR 211:2023
- Visqueen certified with Quality Management System ISO 9001:2015
- Visqueen certified with Occupational Health and Safety System ISO 45001:2018
- Visqueen certified with Environmental Management System ISO 14001:2015

Usage

VisqueenPro Detailing Strip is used for sealing junctions and complicated detailing in Visqueen gas protection systems, waterproofing systems, and damp proofing systems. It can be used on concrete, blockwork, brickwork, particle boards, steel work, steel stanchions and wooden substrates for both vertical and horizontal application.

Storage and handling

Store in a dry and clean environment in its current packaging. The product must be stored upright.

VisqueenPro Detailing Strip can be cut with a sharp retractable safety knife.

Care should be taken when handling the product in line with current manual handling regulations.

Preparation

Surfaces must be smooth and free from sharp protrusions, ensure the surface and working area is not water logged and is frost free. When applying to blockwork or brickwork the joints must be flush pointed. Prior to bonding, substrates such as masonry, concrete and steel should be primed using Visqueen HP Tanking Primer and allowed to dry thoroughly. Visqueen HP Tanking Primer must not be used on Insulation or ICF systems.

Installation

Position and peal back the VisqueenPro Detailing Strip release film and apply the pressure sensitive, self adhesive face to the prepared substrate. Apply pressure by rollering to ensure a full bond is achieved. All lap joints should be a minimum of 150mm and must be pressed and rolled to ensure damp, gas or waterproofing continuity.

When used for sealing membranes punctures, VisqueenPro Detailing Strip should be lapped at least 150mm beyond the extents of the puncture.

Usable temperature range

It is recommended that VisqueenPro Detailing Strip should be installed above -5°C. Prior to installation, ensure that frost or ice is not present on the substrate.

Additional information

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VisqueenPro Detailing Strip, 300mm x 10m

VisqueenPro Detailing Strip data table

Property	Value
Width	300mm
Length	10m
Application temperature range	-5°C to 40°C
Peel Adhesion BS EN 12316, ASTM D1000, in N/cm @ 5°C	
Polyethylene	20.7
Polyethylene with no static charge	21.2
Steel	26.9
Concrete (smooth)	28.8
Mean water vapour resistance factor, BS EN 1931, u	3960000
Mean water vapour diffusion equivalent air layer thickness BS EN 1931, (Sd) in m	4752
Mean water vapour resistance, BS EN 1931, MNs/g	23760
Mean water vapour permeability, BS EN 1931, g/m2/day	0.03

Health and safety information

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Technical Datasheet

Visqueen RadonBlok Double Sided Tape, 30mm x 30m

Features & benefits

- Part of Radon protection IAB approved jointing system
- Provides resistance to Radon gas ingress and moisture ingress

Product description

Visqueen RadonBlok Double Sided Tape is a yellow butyl based, double sided tape.

The tape is 30mm x 30m, has an oversized release film to aid removal.

Approvals and standards

- Visqueen certified with Quality Management System ISO 9001:2015
- Visqueen certified with Occupational Health and Safety System ISO 45001:2018
- Visqueen certified with Environmental Management System ISO 14001:2015

Usage

Visqueen RadonBlok Double Sided Tape is used to bond Visqueen RadonBlok 400 and 600 membranes lap joints.

To complete the joint, seal using VisqueenPro Single Sided Tape, 75mm x 25m.

Storage and handling

Store in dry and clean environment in its current packaging. The tape should not be exposed to long periods of ultraviolet light. Prior to use to aid adhesion, store in warm conditions above 10°C.

Preparation

Ensure the membrane lap area is clean, dry and free from contamination such as dust or sand. Avoid areas of unsupported jointing.

Installation

Apply Visqueen RadonBlok Double Sided Tape to the lap area of the laid sheet starting approximately 50mm from the membrane edge. Apply pressure to the tape to ensure the tape has adhered to the membrane. Remove quick release paper from the tape and overlap the adjoining membrane by minimum 150mm and seal with VisqueenPro Single Sided Tape.

Once the tapes are applied, the completed lap should be well rolled with firm pressure to ensure continuity with the adjacent sheet has been achieved.

Usable temperature range

It is recommended that Visqueen RadonBlok Double Sided Tape and other system components should be installed above 5°C.

Additional information

Prior to use to aid adhesion, store in warm conditions above 10°C.

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Health and safety information

Refer to the Visqueen RadonBlok Double Sided Tape safety datasheets (SDS).

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Visqueen RadonBlok Double Sided Tape, 30mm x 30m

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Technical Datasheet

Visqueen Top Hat Units

Features & benefits

- Provides an airtight and damp proof seal around service pipe penetrations

Product description

Visqueen Top Hat Units are made from rigid black polethylene. and are supplied with a metal jubilee clip.

The units are available in the following standard sizes: 110mm, 135mm and 160mm. These sizes relate to the external diameter of the pipe.

Non standard sizes produced from flexible material are available on request.

Approvals and standards

- Visqueen certified with Quality Management System ISO 9001:2015
- Visqueen certified with Occupational Health and Safety System ISO 45001:2018
- Visqueen certified with Environmental Management System ISO 14001:2015

Usage

Visqueen Top Hat Units are used in conjunction with Visqueen damp proof membrane and Visqueen radon membranes to provide continuity of protection at service pipe penetrations.

System components

- VisqueenPro Double Sided Jointing Tape, 50mm x 10m
- VisqueenPro Single Sided Tape, 75mm x 25m

Storage and handling

Visqueen Top Hats should be stored under cover in their original packaging.

To aid installation, store in warm conditions (above 5°C) prior to use.

Care should be taken when handling the product in line with current manual handling regulations.

Preparation

Ensure all surfaces are clean, dry and free from contamination such as dust or sand. Avoid areas of unsupported jointing.

Installation

Cut a circular hole in the Visqueen membrane as close as possible to the pipe. Bond the Visqueen Top Hat Unit to both the pipe and the membrane with VisqueenPro Double Sided Jointing Tape. Seal the top hat laps to the pipe and membrane with VisqueenPro Single Sided Tape. N.B. An alternative taping system may be specified.

Complete the installation by fixing the supplied jubilee clip around the top hat upstand.

Usable temperature range

it is recommended that Visqueen Top Hat Units and associated system components should not be installed below 5°C.

Additional information

Where protection to BS8485:2015 + A1:2019 or VOCs are required, use Visqueen Ultimate Top Hat Units.

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Health and safety information

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Visqueen Top Hat Units

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Technical Datasheet

Visqueen TreadGUARD 300, 2m x 75m

Features & benefits

- Protects construction membranes from damage from rebar and following trades
- Large format roll - rapidly covers large areas

Product description

Visqueen TreadGUARD 300 is a white non woven polypropylene geotextile protection fleece supplied in single wound rolls 2m x 75m.

Approvals and standards

- Visqueen certified with Quality Management System ISO 9001:2015
- Visqueen certified with Occupational Health and Safety System ISO 45001:2018
- Visqueen certified with Environmental Management System ISO 14001:2015

Usage

Visqueen TreadGUARD 300 is used to protect construction membranes.

It is suitable In horizontal applications for the protection of damp proof membranes and gas membranes from rebars and following trades.

For substructure membrane protection use Visqueen TreadGUARD 1500.

Storage and handling

Visqueen TreadGUARD 300 should be stored under cover in its original packaging.

Care should be taken when handling the product in line with current manual handling regulations.

Preparation

Prior to installation, ensure the membrane to be protected is free from surface debris that may cause puncture.

Visqueen TreadGUARD 300 can be cut with a sharp retractable safety knife or robust scissors.

Installation

Apply Visqueen TreadGUARD 300 by unrolling across the laid construction membrane and overlap by a minimum 100mm.

Ensure that the protection layer is suitably weighted down during windy weather conditions.

The finishing layer e.g. backfill, concrete slab, etc should be applied within 30 days.

Usable temperature range

Although there are no limitations to the usable temperature range for Visqueen TreadGUARD 300, it is recommended that the Visqueen products associated with this system component should not be installed below 5°C.

Additional information

In the event that Visqueen TreadGUARD 300 lap joints require sealing, use Visqueen GR Lap Tape.

The information in this datasheet was correct at the time of publication. It is the user's responsibility to obtain the latest version of the datasheet as it is updated on a regular basis. The information contained in the latest datasheet supersedes all previously published editions.

Property	Test method	Result
Colour		White
Dimensions		2m x 75m
Thickness at 2kPa	BS EN 9863-1	3.5mm
Static puncture (CBR)	BS EN ISO 12236	2kN
Tensile Strength MD	BS EN ISO 10319	10 kN/m

Heanor Gate Road, Heanor, Derbyshire, DE75 7RG
+44 (0) 333 202 6800 I enquiries@visqueen.com I www.visqueen.com

Visqueen TreadGUARD 300, 2m x 75m

Tensile Strength CD	BS EN ISO 10319	10 kN/m
Elongation at break MD	BS EN ISO 10319	80%
Elongation at break CD	BS EN ISO 10319	80%

Health and safety information

Refer to the Visqueen TreadGUARD 300 safety datasheets (SDS).

About Visqueen

Visqueen is a leading provider of construction membrane technologies and design-based solutions for ground gas, structural waterproofing, damp proofing and fire protection.

We offer complete support at every stage of the specification, including the supply chain process. As the UK's principal technical authority, we are best placed to ensure that the principal designer and contractor specify the most technically suited, durable, and competitive solution to guarantee their project is protected for the lifetime of the building.

Visqueen is at the forefront of advanced membrane technology and innovation in the construction industry, earning the trust and loyalty of specifiers throughout the UK and Europe.

For more information, visit visqueen.com or contact our sales office at +44 (0) 333 202 6800 or enquiries@visqueen.com

Complete Range, Complete Solution



Passive Fire Protection | Gas Protection | Damp Proof Membrane | Air and Vapor Control | Stormwater | Damp Proof Course | Temporary Protection

Visqueen Technical Support

Visqueen offer a comprehensive full nationwide technical support. Our team of CSSW qualified technical support managers provide on site design-based solutions for specifiers, contractors and builders merchants, and will ensure that from design stage to installation the project is fully risk assessed and the specification is approved by all stakeholders.

Our Technical Office, can design, prepare and manage CAD detailing, together with assisting in quantity take offs, while offering advice on technical installations and product selection.

Competency & Design

Visqueen promotes competency in building design by ensuring that its technical team possesses the necessary skills, knowledge, experience, and ethical practices. The company adopts the "golden thread of information," ensuring all project data is digitally secure and accessible throughout a building's lifecycle. This approach aligns with the Building Safety Act and aims to foster accountability and compliance with evolving regulations, providing clients with confidence in the safety and reliability of their projects.

Visqueen CPD Seminars

Visqueen's CPD Seminars offer insights into Building Regulations, Standards, and industry guidance related to damp proofing, hazardous ground gas protection, and structural waterproofing. These one-hour seminars are tailored for construction design professionals and delivered by our Technical Support Managers. Visit our website to book a free CPD.

Visqueen Contract Design Services

Visqueen Contract Design Services offers a bespoke design service led by our team of Certified Surveyors in Structural Waterproofing (CSSW), providing experienced and specialised waterproofing design expertise for complex projects. We provide comprehensive support throughout the entire project, ensuring that all work meets the requirements of warranty providers and adheres to the highest standards of quality, reliability and current legislation.

Visqueen Training Academy

Heanor Gate Road, Heanor, Derbyshire, DE75 7RG
+44 (0) 333 202 6800 I enquiries@visqueen.com I www.visqueen.com

Visqueen TreadGUARD 300, 2m x 75m

Based at our Derbyshire facility, the Visqueen Training Academy offers a variety of training programs across the UK. These include one-day product awareness sessions for distributors and builders' merchants, and intensive two-day courses for hands-on product installation training. Contact us for more information.

Heanor Gate Road, Heanor, Derbyshire, DE75 7RG
+44 (0) 333 202 6800 I enquiries@visqueen.com I www.visqueen.com









FILOseal+

universal re-enterable duct sealing system

duct opening up to Ø 200 mm

Larger sizes available upon request

Duct sealing system FiloSeal+ is a universal solution for sealing cables and pipes in ducts, drilled holes or transit frames.

The tri-flexible foam makes positioning and separation of the cables very simple while also providing a backing for the MD+ to be applied on to. FiloSeal+ is suitable for sealing any cable configuration or pipes contained in one duct and also allows easy re-entry of the seal to add or remove cables or pipes as required. The Filoform duct sealing system FiloSeal+ uses our MD+ sealant which is easily applied from a skeleton gun. The high quality, one component, flexible sealant "MD+" is based on a silicone compound that cures with air (Humidity).

After application and full curing the thixotropic MD+ forms a plastic elastomer mass with special qualities effectively sealing and bonding, while providing a high level of durability.

FEATURES

- Flexible, one component, adhesive and sealing compound in a cartridge (310ml)
- High levels of Gas and Water tightness
- Excellent adhesion
- Resistant against Water, Alkaline, Chemical agents
- Resistant to Hydrocarbons
- Suitable for sealing underground cable ducts set out within the APEA 'Blue Book'
- Resistant to Hydrogen Sulphide / Methane and many other Gases (NedLab)
- Resistant to rats
- Resistant to termites (Mastotermes Darwiniensis) Northern Australian termites
- Non corrosive
- Solvent free
- Shock absorbing
- Non toxic, neutral and almost odourless
- Complies with ATEX regulations
- WIMES Compliant, 3.02 (April 2013) Section 6.4.3.2-d.
- Suitable for any shaped duct / bore hole / opening
- Seals all known materials, PVC & PE sheathed cables, PILC, (HD) PE pipes
- Suitable for renovations, can be installed retrospectively
- Up to 1 bar pressure resistance
- Quick & easy to install, especially in vertical ducts
- Non Hazardous
- Over 25 years of operational experience

Product Name	Duct diameter min.-max. (mm)	Maximum cable diameter in the duct (mm)	Order unit
FiloSeal+125 mm	Ø 125 max.	Ø 95 max.	per piece
FiloSeal+ 200 mm	Ø 200 max.	Ø 160 max.	per piece

For enquiries contact our sales department.

BROWNFIELD SOLUTIONS LTD
GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

Gas Protection Measures Inspection Checklist

Sub-floor void	Is a check possible? Void former? Gravel (type/specification)? Height of void space? Is it clear?
External wall airbricks	Numbers, size, positions as design drawing?
Internal sleeper walls	Ventilation holes (honeycomb brickwork/pipe crossings?) – size, spacing, location in accordance with design?
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 structure?
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.
Gas membrane type	Manufacturer and product specification, gauge, colour, brand/name, material batch/roll numbers, storage arrangements (protected from dirt/damage?)
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 gas membrane?
Joining tape product	Product type, brand, thickness, material, width, colour? Use of double sided tape?
Lapping design	Joints lapped and sealed in accordance with manufacturer's requirements/ specification? Minimum overlap? Sections taped twice?
Laps and joints sealed	Welds complete? Appropriate joining/double sided tape used?
Service entries sealed	Top hats seal arrangements fixed around service entries? Use of Jubilee clips?
Cavity Inspection	Confirm that the cavity is not blocked with debris, check that there are no rips in the membrane across the cavity and the jointing detail (if present) is fully sealed.

Verification of Ground Gas Protection Systems

BROWNFIELD SOLUTIONS LTD

Job No:
Client:
Site Name:
Plot/Area Number (s):
Weather:
Verifier/Inspector (s):

Drawing Refs:
Structure Type:
Floor Slab Type:
Gas protection Type:
Installer and competancy (e.g. NVQ)

Passive Venting Measures	✓/✗	Inspection Date (s)	Photos:	
Void Former				
Void Height				
Gravel Type				
External Wall Air Bricks				
Internal Sleeper Wall Vents				
External Vent Trench/Duct				

Gas Barrier/Membarne	✓/✗	Inspection Date (s)	Photo	
Underside of membrane				
Membrane Type				
Extent of Coverage				
Slab/membrane condition				
Jointing tape product				
Laps, joints, welds and seals				
Damp-proof course				
Service entries and seals				
Cavity inspection				

This plot/area **REQUIRES FURTHER INSPECTION**

Where the above inspection indicates a Pass, construction worksn for that plot/area may proceed, subject to suitable protection measures of the membrane being applied in accordance with the manufacturer's recommendations.

Compiled by: Insert Signature here Print Name (overwrite here)

Checked By: Insert Signature here Print Name (overwrite here)

Experience and Qualifications of Verifiers of Ground Gas Protection Systems

Brownfield Solutions Ltd hold ISO9001 and 14001 accreditations for our IMS. We are registered members of the CHAS Health and Safety accreditation scheme, members of the Association of Geotechnical and Geo-Environmental Specialists (AGS) and Gold Constructionline Members.

Where verifiers are required to hold either NVQ L4 or SGPV status and no BSL staff member who holds these qualifications/certifications is available, then works will either be subcontracted to a suitably competent specialist: https://claire.co.uk/projects-and-initiatives/sgpv-register

Aaron Stokoe

Qualifications:
BSc (Hons) (Geology) CSci MIEnvSc FGS
Chartered Scientist (2018)

Professional Bodies:
Member of the Institute of Environmental Science (IES)
Fellow of the Geological Society (FGS)

Relevant CPD Training and Experience Summary:
Valid and in date CSCS Card held (scan available on request)
GGS Two Day A-Z of Ground Gas Protection June 2016
CL:AIRE Webinar "An Introduction to the Verification of Ground Gas Protection Measures"
Visqueen CPD Seminar 1: Gas Protection - Protecting against gas on contaminated land 28 March 2019
LQM Technical Briefing Webinar (Ground Gases) "Correct Application of BS8485 to Characterise Gas Risk" 3 May 2019
Proctor Group Webinar "Protection of Buildings on Brownfield Sites" 18 February 2020
Environmental Analyst Webinar "Mine Gas Risk Assessment: Best Practice" 2 April 2020
Property Care Association (PCA) Webinar "Verification of Ground Gas Protection Systems" 23 July 2020.
Property Care Association (PCA) Webinar "Controlling Ground Gases & Water – How to get Synergy" watched 12 January 2021
SoBRA – Ground Gas September 2021
SoBRA – Vapour Risk October 2021
Atlas Copco Compressors "Introduction to Compressed Air" 8 January 2021 (compressor for air lance)
British Compressed Air Society "Working Safely with Compressed Air" January 2021 (compressor for air lance)
GGS Webinar Verification of ground gas protection – How to do it well May 2023.
CL:AIRE Good Practice for Risk Assessment for Coal Mine Gas Emissions Training May 2024.

Chartered Scientist with circa 15 years' experience in ground investigation, characterisation of ground gas regimes, recommendations for ground gas protection systems and verification of installed systems.

Dan Gates

Qualifications:
MGeoscience (Geology) FGS

Professional Bodies:
Fellow of the Geological Society (FGS)

Relevant CPD Training and Experience Summary:

Valid and in date CSCS Card held (scan available on request)
GGS Two Day A-Z of Ground Gas Protection 18 October 2017
Visqueen CPD Seminar 1: Gas Protection - Protecting against gas on contaminated land 28 March 2019
Atlas Copco Compressors "Introduction to Compressed Air" 8 January 2021 (compressor for air lance)
British Compressed Air Society "Working Safely with Compressed Air" January 2021 (compressor for air lance).

Senior project engineer with over 12 years' experience in ground investigation, characterisation of ground gas regimes, recommendations for ground gas protection systems and verification of installed systems.

Jack Mather

Qualifications:
BSc (Hons) (Geology) MIEnvSc FGS

Professional Bodies:
Fellow of the Geological Society (FGS)
Member of the Institute of Environmental Science (IES)

Relevant CPD Training and Experience Summary:
Valid and in date CSCS Card held (scan available on request)
Visqueen CPD Seminar 1: Gas Protection - Protecting against gas on contaminated land 28 March 2019
Neil Salvidge TD&A Ltd "Ground Gas Protection installation covering basic membrane installation methods of heat fusing, detailing, and implementation of Verification in accordance with CIRIA C735" 29 January 2020 (Full day Course)
Proctor Group CPD Webinar: Ground Gas Protection 16 October 2020
CL:AIRE CPD Webinar: Verification of Gas Protection Systems 16 October 2020
Property Care Association CPD Webinar: Verification of Ground Gas Protection Systems 16 October 2020

Senior project engineer with over 7 years' experience in ground investigation, characterisation of ground gas regimes, recommendations for ground gas protection systems and verification of installed systems.

Tim Mayall

Qualifications:
MGeol (Hons) (Geology) FGS

Professional Bodies:
Fellow of the Geological Society (FGS)

Relevant CPD Training and Experience Summary:
Valid and in date CSCS Card held (scan available on request)
Visqueen CPD Seminar 1: Gas Protection - Protecting against gas on contaminated land 28 March 2019
Neil Salvidge TD&A Ltd "Ground Gas Protection installation covering basic membrane installation methods of heat fusing, detailing, and implementation of Verification in accordance with CIRIA C735" 29 January 2020 (Full day)
Environmental Analyst Webinar "Mine Gas Risk Assessment: Best Practice" 2 April 2020
Atlas Copco Compressors "Introduction to Compressed Air" 8 January 2021 (compressor for air lance)
British Compressed Air Society "Working Safely with Compressed Air" January 2021 (compressor for air lance)

Senior project engineer with circa 7 years' experience in ground investigation, characterisation of ground gas regimes, recommendations for ground gas protection systems and verification of installed systems.

Nicola Swallow

Qualifications:
BSc (Hons) (Environmental Science) MSc MIEnvSc

Professional Bodies:
Member of the Institute of Environmental Science (IES)

Relevant CPD Training and Experience Summary:
Valid and in date CSCS Card held (scan available on request)
Visqueen CPD Seminar 1: Gas Protection - Protecting against gas on contaminated land 28 March 2019.

Senior Project engineer with over 12 years' experience in ground investigation, characterisation of ground gas regimes, recommendations for ground gas protection systems and verification of installed systems.

Tim Wilson

Relevant CPD Training and Experience Summary:
Valid and in date CSCS Card held (scan available on request)
Neil Salvidge TD&A Ltd "Ground Gas Protection installation covering basic membrane installation methods of heat fusing, detailing, and implementation of Verification in accordance with CIRIA C735" 25 January 2022 (Full day Course)

Senior Geo-Environmental Technician with over 20 years' experience in the construction industry trade.

Jake Wheaton

Qualifications:
BSc (Hons) (Geology) MIEnvSc FGS

Professional Bodies:
Fellow of the Geological Society (FGS)
Member of the Institute of Environmental Science (IES)

Relevant CPD Training and Experience Summary:
Valid and in date CSCS Card held (scan available on request)
Neil Salvidge TD&A Ltd "Ground Gas Protection installation covering basic membrane installation methods of heat fusing, detailing, and implementation of Verification in accordance with CIRIA C735" 22 June 2022 (Half day Course)

Senior project engineer with circa 8 years' experience in ground investigation, characterisation of ground gas regimes, recommendations for ground gas protection systems and verification of installed systems.

Megan Buckley

Qualifications:
BSc (Hons) AMIEnvSc

Relevant CPD Training and Experience Summary:
Valid and in date CSCS Card held (scan available on request)
Neil Salvidge TD&A Ltd "Verification of Ground gas protection systems in accordance with C735 and NOS VR764" April 2024 2023 (Full day Course).

Project engineer with circa 3 years' experience in ground investigation, characterisation of ground gas regimes, recommendations for ground gas protection systems and verification of installed system under supervision of senior staff.

Kyle Bolderson

Qualifications:
BSc (Hons) MSc FGS
Relevant CPD Training and Experience Summary:
Valid and in date CSCS Card held (scan available on request)
Neil Salvidge TD&A Ltd "Verification of Ground gas protection systems in accordance with C735 and NOS VR764" April 2024 (Full day Course).

Graduate project engineer with circa 2 years' experience in ground investigation, characterisation of ground gas regimes, recommendations for ground gas protection systems and verification of installed system under supervision of senior staff.

Amber Hunt

Qualifications:
BSc (Hons) FGS

Relevant CPD Training and Experience Summary:
Valid and in date CSCS Card held (scan available on request)
Neil Salvidge TD&A Ltd "Verification of Ground gas protection systems in accordance with C735 and NOS VR764" April 2024 (Full day Course).

Graduate project engineer with a years' experience in ground investigation, characterisation of ground gas regimes, recommendations for ground gas protection systems and verification of installed system under supervision of senior staff.

Sam Jennings

Relevant CPD Training and Experience Summary:
Valid and in date CSCS Card held (scan available on request)
Neil Salvidge TD&A Ltd "Verification of Ground gas protection systems in accordance with C735 and NOS VR764" 10 May 2023 (Full day Course).

Technician with circa 2 years' experience in verification works, ground works and ground gas monitoring.

George Kerr

Relevant CPD Training and Experience Summary:
Valid and in date CSCS Card held (scan available on request)

Neil Salvidge TD&A Ltd "Verification of Ground gas protection systems in accordance with C735 and NOS VR764" 10 May 2023 (Full day Course).

Technician with a years' experience in verification works, ground works and ground gas monitoring. Studying part time for bachelor's degree in Environmental Science.

Peter Holland

Qualifications:
BSc (Hons) (Geology)

Relevant CPD Training and Experience Summary:
Valid and in date CSCS Card held (scan available on request).
Neil Salvidge TD&A Ltd "Ground Gas Protection installation covering basic membrane installation methods of heat fusing, detailing, and implementation of Verification in accordance with CIRIA C735" 29 January 2020 (Full day).

Project engineer with circa 3 years' experience in ground investigation, characterisation of ground gas regimes, recommendations for ground gas protection systems and verification of installed system.

Joel Massey

Qualifications:
BSc (Hons) (Geography) AMIEnvSc

Relevant CPD Training and Experience Summary:
Valid and in date CSCS Card held (scan available on request).
Neil Salvidge TD&A Ltd "Ground Gas Protection installation covering basic membrane installation methods of heat fusing, detailing, and implementation of Verification in accordance with CIRIA C735" 29 January 2020 (Full day).

Project engineer with circa 3 years' experience in ground investigation, characterisation of ground gas regimes, recommendations for ground gas protection systems and verification of installed system.

CAUTION

THE MEMBRANE YOU WILL ENCOUNTER ACROSS THIS SITE IS NOT JUST A DPM. THIS MEMBRANE IS A GAS BARRIER!!



IT HAS BEEN PURPOSEFULLY SELECTED TO PROTECT THE FUTURE OCCUPANTS OF THIS BUILDING.

PLEASE BE CAREFUL NOT TO DAMAGE.
ALTHOUGH IT CAN BE REPAIRED AND PATCHED, UNREPORTED DAMAGE AND CUTS CAN RENDER THE MEMBRANE USELESS.



THE GROUND CONDITIONS BENEATH YOUR FEET ON THIS SITE HAVE THE POTENTIAL TO PRODUCE ASPHYXIANT OR EXPLOSIVE GASES. THESE PRESENT NO RISK IN YOUR DAILY TASKS BUT CAN ACCUMULATE IN A CLOSED BUILDING OVER TIME. THE GAS BARRIER IS VITAL FOR THE HEALTH AND WELLBEING OF THOSE WHO OCCUPY THIS BUILDING.

APPENDIX D

Non-Specialist Matching Brief Guidance

NON-SPECIALIST WATCHING BRIEF REQUIREMENTS

DISPLAY & AWARENESS

- This document should be placed on the **Health & Safety Notice Board** and /or displayed in a prominent area where all site staff are able to consult it at any time.
- Any member of the workforce entering the site to undertake any excavation must be made aware of the potential to discover contamination and follow the requirements below.

HOW TO IDENTIFY POTENTIALLY CONTAMINATED MATERIAL

- Looks oily and has an oily/petrol/diesel odour; rainbow/iridescent sheen on groundwater.
- Solvent (e.g. glue or sweet) type of odour.
- Man-made materials in soil such as domestic waste, oil drums, tank structures, car parts etc.
- Contains fragments of possible asbestos cement sheet/lagging etc.

(Examples only – This list is not exhaustive. If in doubt, then please ask the Site Manager)

Oily Sheens



Asbestos – Insulation



Asbestos – Cement Sheeting



PROCEDURE

If unexpected evidence of contamination is found, the following procedures should be followed:

1. All site works at the position of the suspected contamination should stop.
2. Site Personnel to inform the Site Manager.
3. Visual and olfactory observations of the condition of the ground and the extent of contamination should be made, including photographs, and notification given to Brownfield Solutions (BSL).

If required, BSL shall attend site to inspect and provide advice. Testing may be required on suspect materials to determine re-use options or confirm potential removal requirements

North

William Smith House
173 – 183 Witton Street
Northwich
Cheshire
CW9 5LP

Tel: 01606 334 844

Midlands

Unit 5, Alfred Court
Saxon Business Park
Stoke Prior
Bromsgrove
Worcestershire
B60 4AD

Tel: 01215 729 014

South

Suite 8-9
Tapnage Farm
Titchfield Lane
Wickham
Hampshire
PO17 5PQ

Tel: 0800 044 8025

www.brownfield-solutions.co