



**BROWNFIELD
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GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

BEECH CONSTRUCTION PARTNERSHIP

Jordan Street, Manchester

Geo-Environmental Assessment Report

JMC/C3512/6770

April 2017



EXECUTIVE SUMMARY -JORDAN STREET, MANCHESTER	
Location	The site is centred on National Grid Reference 383477, 397412 within Manchester City Centre
Site History	The sites previous use was residential. The buildings were demolished circa 1963 and the site has remained undeveloped.
Geology	The I geology comprises Glaciofluvial deposits over Sherwood Sandstone.
Ground Conditions	Made ground was encountered in all of the window sample locations and was varied across the site to a maximum depth of 4.10m overlying gravelly sand, this in turn was overlying sandstone bedrock at depths of between 3.90m and 4.10m.
Foundations and Floor Slabs	The most suitable foundations for the development are considered to be driven piles end bearing on the weathered sandstone in rock sockets between 4.00m and 5.00m with a suspended floor slab.
Soil Contamination	Elevated lead and PAHs have been detected in the samples tested to date. Chrysotile fibres have been identified in three samples at trace levels.
Ground Gases	A peak carbon dioxide concentration of 0.1%v/v has been detected therefore no gas protection measures are required in the new development based on the initial visit. Gas monitoring is ongoing and a full assessment will be submitted on completion of the programme.
Highways	CBR values of 1% are likely to be achieved in made ground soils for pavement design purposes, unless proven otherwise by in-situ testing at sub-base level by a specialist geotechnical engineer.
Further Work	• Completion of gas monitoring programme. • Issue gas assessment. • Design of remedial strategy if required. • Foundation design • Confirmation of recommendations made with the Local Authority

PROJECT QUALITY CONTROL DATA SHEET

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DRAWINGS

Drawing Number	Rev	Title
C3512/01	-	Site Location Plan
C3512/02	-	Pertinent Site Features Plan
C3512/03		Exploratory Hole Location Plan

APPENDICES

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APPENDIX B	Testing Results
APPENDIX C	Ground Gas Monitoring Results
APPENDIX D	Contaminated Land Screening Values
APPENDIX E	Contaminated Land Legislative Background
APPENDIX F	Risk Assessment Methodology
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**GEO-ENVIRONMENTAL ASSESSMENT REPORT
FOR A SITE OFF
JORDAN STREET, MANCHESTER**

1.0 INTRODUCTION

1.1 Objectives

- 1.1.1 This report describes a Geo-environmental Assessment carried out by Brownfield Solutions Limited (BSL) Beech Construction Partnership on a site off Jordan Street, Manchester.
- 1.1.2 This report should be read in conjunction with Scott Hughes Desk Study Assessment Report (2731/DTS) issued in January 2014
- 1.1.3 The objectives of the assessment were to confirm or otherwise the findings of the Desk Study through windowless sampling, chemical testing and monitoring and to determine the foundations used in the proposed development.
- 1.1.4 The report has been completed to fulfil the requirements of a preliminary risk assessment in accordance with CLR11 "Model Procedures for the Management of Land Contamination".

1.2 Proposed Development

- 1.2.1 The proposed development is residential steel framed seven storey apartment building.

1.3 Limitations

- 1.3.1 This assessment has been carried out based on information obtained from Scott Hughes Desk Study Assessment Report (2731/DTS) and a number of other areas, BSL have assumed that this information is correct.
- 1.3.2 There may be other conditions prevailing on the site which are outside the scope of work and have not been highlighted by this assessment and therefore not been taken into account by this report. Responsibility cannot be accepted for such site conditions not revealed by the assessment.
- 1.3.3 This report has been prepared for the sole use of the client. No other third parties may rely upon or reproduce the contents of this report without the written permission of Brownfield Solutions Ltd (BSL). If any unauthorised third party comes into possession of this report they rely on it at their own risk and BSL do not owe them any Duty of Care.

2.0 THE SITE

2.1 Location & Access

- 2.1.1 The site covers an area of circa 0.48 hectares and is situated within Manchester City Centre.
- 2.1.2 The site is centred on National Grid Reference 383477, 397412 as shown on the Site Location Plan C3512/01.
- 2.1.3 Access to the site is gained off Jordan Street to the east of the site or Commercial Street to the south west of the site.

2.2 Site Description

- 2.2.1 The site is square in shape and topographically level, bound by wood hoarding and is currently used for vehicle parking.
- 2.2.2 The majority of the site is surfaced in tarmac with some areas towards the east and south covered with loose gravel surfacing.
- 2.2.3 A small brick building is present on the northern area of the site which is used for storage of tools. There is evidence of fly tipping towards the north east of the site.
- 2.2.4 The site is located in a mixed residential and commercial area surrounded by office buildings and apartments.
- 2.2.5 Pertinent site features are shown on drawing C3512/02



3.0 DESK STUDY SUMMARY

3.1 A summary of the relevant points from the desk study is presented in the table below:

- The sites only previous use was residential. The buildings were demolished circa 1963 and the site remains undeveloped.
- Geology comprises Glaciofluvial deposits (Secondary A) over Sherwood Sandstone (Principal Aquifer).
- The site lies in a Coal Mining Area and coal is likely to exist beneath the site however it is unlikely that coal will be worked in the future and the risk is considered to be low.
- The nearest watercourse is the River Medlock circa 50m to the south east and south west of the site.
- The site is located in a Zone 2 floodplain.
- No radon protection measures are required.
- The risk from soils on the site is moderate/low to low.
- The risk from gas is moderate.



4.0 METHOD OF INVESTIGATION

4.1 Objectives

4.1.1 The aim of the fieldwork was to:

- Investigate ground conditions on the site.
- Assess the potential contamination on the site and obtain samples for contamination screening.
- Assess the potential impact of any contamination on controlled waters.
- Assess the need for detailed investigation.
- Obtain geotechnical information on the ground conditions at the site for preliminary foundation design and preliminary pavement design purposes.
- Install standpipes to allow future monitoring.
- Give an assessment of the geo - environmental risks associated with redevelopment of the site.

4.2 Site Works

4.2.1 Six Window sample boreholes (WS1 to WS6) were drilled to depths of between 2.70m and 4.30m using a tracked window sampling rig and liners (windowless) on 9th March 2017.

4.2.2 The approximate locations of the exploratory holes are indicated on the Exploratory Hole Location Plan, C3512/02. The exploratory hole logs are presented in Appendix A.

4.2.3 The exploratory holes were positioned to establish general ground conditions on the site. The exploratory holes were logged by an experienced geo-environmental engineer in general accordance with BS 5930:2015 'Code of Practice for Site Investigations' 2015, BS EN 14688-1:2002 'Geotechnical Investigation and Testing – Identification and classification of soil' and BS EN ISO 14689:2002 "Geotechnical investigation and testing – Identification and classification of rock".

4.3 Sampling

4.3.1 During the drilling of the exploratory holes, representative samples were taken at regular intervals to assist in the identification of the soils and to allow subsequent laboratory testing.

4.3.2 A summary of the samples taken is presented in the table below:

Type	Number
Environmental	26
Disturbed	22

4.3.3 The type of sample is dependent upon the stratum and the purpose of analysis in accordance with current environmental and geotechnical guidance.



4.3.4 Disturbed samples of soil for chemical testing were placed in plastic tubs and amber jars as required by the UKAS accredited laboratory, and transported under secure refrigerated conditions.

4.3.5 The distribution of samples taken across the site is recorded on the exploratory logs.

4.4 Laboratory Testing

4.4.1 As part of the assessment for potential contamination of the site, selected samples were taken for the purpose of chemical contamination testing.

4.4.2 The following were analysed at an UKAS approved laboratory:

Determinand	Matrix	Number
Soil Suite 2: Arsenic, cadmium, chromium (total and hexavalent), copper, lead, mercury, nickel, selenium, zinc and pH.	Soil	4
TPH CWG	Soil	2
Asbestos Screening	Soil	4

4.4.3 Representative disturbed samples were obtained for all soil types encountered. Selected samples were scheduled for testing at an approved laboratory in accordance with BS 1377 'Method of Test for Soils for Civil Engineering Purposes' 1990. The following tests were scheduled:

BS Test Number	Description	No of Samples
Part 3:	pH Value	5
Part 3:	Water Soluble Sulphate Content	5

4.4.4 The Chemical and Geotechnical Laboratory Testing Results are presented in Appendix B.

4.5 Monitoring

4.5.1 Gas and water monitoring standpipes were installed in three of the boreholes and subsequently one monitoring visit has been undertaken to date. All gas monitoring was undertaken using GA5000 infrared gas meter with integral electronic flow analyser.

4.5.2 Measurements of the percentage volume in air (%v/v) of oxygen (O₂), carbon dioxide (CO₂) and methane (CH₄) were recorded in addition to the percentage Lower Explosive Limit (%LEL) of methane and the atmospheric pressure. Flow measurements on each standpipe (l/hr) were also taken. (Note: 100% LEL equates to 5% by volume).

4.5.3 The standpipes consisted of PVC pipe. A bentonite seal was made around the plain pipe and a clean gravel pack was placed around the slotted pipe. A summary of the installation construction is presented in the table below:



Location	Depth	Response Zone (m bgl)	Targeted Strata	Reason
WS1	3.00	1.00-3.00	Made Ground	Ground Gas
WS2	2.50	1.00-2.50	Made Ground	Ground Gas
WS4	4.00	1.00-4.00	Made Ground	Ground Gas

4.5.4 The results monitored peak and steady state conditions. Peak results are those that occur on opening the valve on the borehole tap. Steady state conditions are those that occur a period of time afterwards when the initial (accumulated) gases have been purged from the borehole.

4.5.5 Interim gas monitoring results are presented in Appendix C of this report.



5.0 GROUND CONDITIONS

5.1 Made Ground

5.1.1 Made ground was encountered in all of the window sample locations and was varied across the site to a maximum depth of 4.10m.

5.1.2 The made ground was generally gravelly sand varying in colour and ash content.

5.1.3 Brick cobbles were encountered in the following locations:

Location	Cobble Content	Depth (m)
WS1	Medium	0.80-1.50
WS1	Low to medium	2.00-3.70
WS2	High	0.20-1.00
WS2	Low to medium	2.40-2.70
WS3	Low to medium	1.70-4.00
WS4	Low to medium	0.00-4.10
WS5	Low to medium	0.15-0.30
WS5	Low to medium	2.90-3.00
WS6	Low	0.47-3.80

5.1.4 WS2 was terminated at 2.70m on a possible basement slab associated with the previous development.

5.2 Natural Ground

5.2.1 Gravelly sand was encountered at the base of the made ground in WS1 at 3.70m, WS5 at 3.50m and WS6 at 3.80m. The sand ranged in thickness from 0.10m to 0.30m.

5.3 Bedrock

5.3.1 Weak fine to coarse grained highly weathered sandstone bedrock was encountered in the following locations.

Location	Depth
WS1	3.90
WS3	4.00
WS4	4.10
WS5	3.80
WS6	3.90

5.4 Groundwater

5.4.1 No groundwater was encountered during the investigation.



5.5 Observations

- 5.5.1 During the works undertaken by BSL observations for both visual and olfactory evidence of contamination were made.
- 5.5.2 Ash and clinker was observed in the made ground in the majority of the window sample boreholes across the site.
- 5.5.3 No olfactory evidence of contamination was observed.



6.0 TEST RESULTS

6.1 Chemical Test Results - Soils

- 6.1.1 The samples were tested for an assessment of the chemical contamination and results were examined with reference to a selection of guidance documents as detailed in Appendix D.
- 6.1.2 The apparent exceedence of the relevant Tier 1 generic screening value for a residential end use without plant uptake is taken as indicating further detailed assessment or remedial action is required.

- **Metals**

Two samples tested contained the following elevated determinands.

Location	Depth (m)	Metal	Concentration (mg/kg)	S4UL (mg/kg)
WS2	0.80	Lead	405	310
WS4	1.00	Lead	1057	310

- **Polyaromatic Hydrocarbons (PAH's)**

Elevated PAH were recorded in one location to date. The location and elevated cementation of PAH's are shown in the table below.

Location	PAH Species	Concentration (mg/kg)	S4UL mg/kg
WS1 0.40m	Benzo(a)pyrene	9.10	3.2
WS1 0.40m	Dibenzo(ah)anthracene	1.18	0.31
WS1 0.40m	Benzo(b) fluoranthene	9.86	3.0

- **Asbestos**

- 6.1.3 Chrysotile asbestos fibres have been detected in the samples shown in the table below. Quantification analysis undertaken identified the concentration of fibres to be <0.001 mass% and therefore are considered a trace amount.

Location	Asbestos Type	Asbestos Level Screen
WS1 0.40m	Fibre Bundles	<0.01%
WS2 0.80m	Fibre Bundles	<0.01%
WS6 0.60m	Fibre Bundles	<0.01%

6.2 SD1 Testing

- 6.2.1 Water soluble sulphate testing was undertaken on seven samples of the made ground and two samples of natural sandstone. The results revealed soluble sulphate (SO₄) contents of 0.0067 g/l and 0.2243 g/l.



- 6.2.2 Associated pH values were obtained which ranged between 8.05 and 8.78 indicating near neutral to slightly alkaline conditions.

6.3 Gas Monitoring Results

- 6.3.1 To date one gas monitoring visit has been carried out on 5th April 2017.
- 6.3.2 A peak carbon dioxide concentration of 0.1%v/v was recorded, steady state concentrations were generally similar.
- 6.3.3 No methane or hydrogen sulphide gas has been detected to date.
- 6.3.4 Oxygen concentrations of between 21.4%v/v and 21.3% v/v were recorded.
- 6.3.5 A maximum Flow reading of 0.2l/hr was recorded in one location across the site.
- 6.3.6 The atmospheric pressure was recorded at 1029mb.



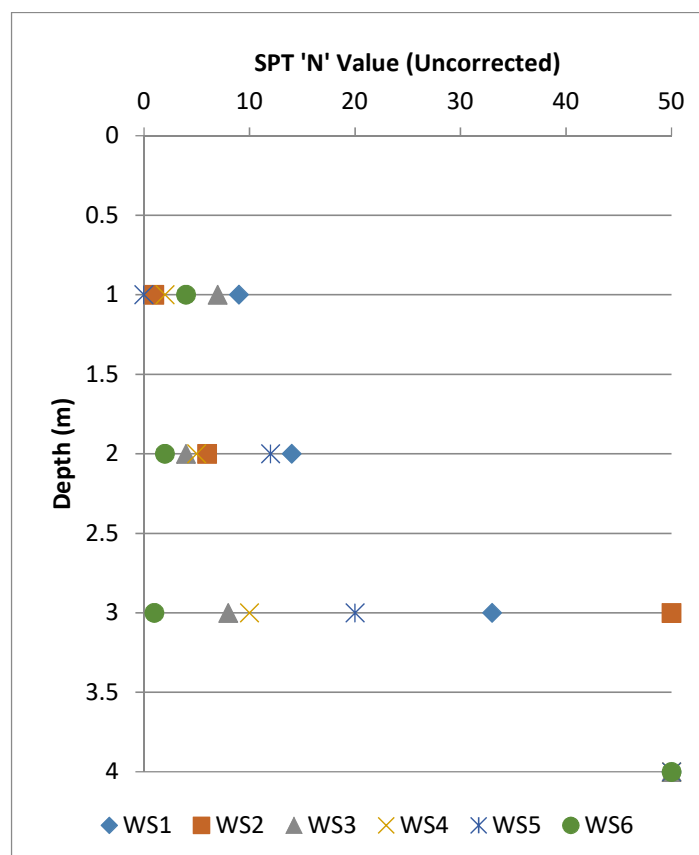
7.0 GEOTECHNICAL ASSESSMENT

7.1 General

- 7.1.1 The site is currently disused with one small brick building present towards the north west of the site.
- 7.1.2 A basement is likely to be present towards the west of the proposed building footprint.
- 7.1.3 No groundwater has been encountered on site during the investigation and subsequent monitoring visit.
- 7.1.4 Made ground has been encountered to a maximum depth of 4.10m and bedrock has been encountered across the site from 3.80m to 4.10m.

7.2 Soil Parameters

- 7.2.1 The test results have been evaluated to derive geotechnical soil parameters for the site. A depth to SPT N value graph is provided below to provide a profile of the ground conditions underlying the site.



- 7.2.2 Characterization of the geotechnical parameters above has been undertaken to select a characteristic value, which is a cautious estimate of the value affecting the occurrence of the limit state.



- 7.2.3 SPT refusals were obtained on bedrock around 4.00m bgl providing suitable founding strata. A refusal was achieved in WS2 at 2.70m however this is believed to be a basement associated with the previous residential development. The Characteristic phi value for the sandstone bedrock at 4m is 41 degrees.

7.3 Foundations

- 7.3.1 Given the presence of deep and non-engineered made ground across the site and the proposed seven storey building without a basement, the use of traditional shallow spread foundations is not considered feasible for the development.
- 7.3.2 The most suitable foundations for the development are considered to be driven piles through the made ground end bearing on the weathered sandstone which was observed to depths of between 3.80m and 4.10m across the site.
- 7.3.3 The pile material required is likely to be steel due to the ability to be driven into bedrock, withstand hard driving and provide lateral stability.
- 7.3.4 Based on the information available preliminary calculations were undertaken for a single steel pile 225mm in diameter and 5.00m in length, an allowable load of 125kN will be provided. Higher allowable loads could be achieved by increasing the diameter of the piles or by using pile groups. The piles formed in rock sockets will also provide some skin friction. It has been assumed the made ground will not provide skin friction and piles will be predominantly end bearing.
- 7.3.5 To achieve required design resistance for Ultimate Limit State and Equilibrium Limit State the layout of piles will need to be considered. Due to the piles end bearing on bedrock Serviceability Limit State conditions will be satisfied by the Ultimate Limit State design.
- 7.3.6 Downdrag is not considered to be an issue at the site based on the granular soils. Locally low SPT N Values have been observed within the made ground, the magnitude of downdrag is dependent on finished site levels and its applied surcharge. If site levels increase the downdrag should be included in the design loadings.
- 7.3.7 The piles should be driven to sett using a pile driving formulae. It is recommended the pile design should be validated by static load testing on working piles 1.5 times the characteristic load on more than 1% of working piles.
- 7.3.8 Further site investigation may be recommended by a piling contractor obtain further information on bedrock and to reduce the risk.
- 7.3.9 It is recommended that information gained from this ground investigation is assessed by an experienced piling contractor such that appropriate piles are selected and designed given the site conditions that have been encountered.



Obstructions

- 7.3.10 Cobbles and boulders have been encountered in the made ground and these could potentially be an issue at the site during piling.
- 7.3.11 The possibility that basements exist beneath the site will need to be taken into consideration during foundation design. The extent of the historic residential properties are shown on drawing number C3512/03. At this stage the extent of the basements is not fully understood. Discussions should be made with the piling contractor in order to address this issue and determine the requirement to undertake enabling works to remove obstructions or the need to predrill the holes.
- 7.3.12 The piling work should be undertaken in accordance with BS EN 12699:2015 'Execution of Special Geotechnical Work - Displacement piles', and also relevant standards associated with manufacturing the piles.

Equilibrium Limit State

- 7.3.13 The depth of the soil overburden is unlikely to be sufficient to develop the required uplift resistance on the pile in shaft friction, therefore the piles will be in tension and may need to be anchored into the rock. It is likely the anchors will be required to satisfy equilibrium limit state conditions.
- 7.3.14 The bond length of the piles should be calculated by a qualified structural engineer based on lateral and uplift resistance. Pile material should be chosen to provide sufficient tensile strength for the design.

7.4 Floor Slabs

- 7.4.1 Made ground in excess of 600mm is present and due to the proposed piling foundation option floor slabs will need to be suspended.

7.5 Construction

- 7.5.1 Instability of the made ground should be allowed for. All excavations should be carried out in accordance with CIRIA Report 97 'Trenching Practice'.
- 7.5.2 Excavation depths should generally be readily achieved using conventional plant (JCB or similar) although high specification plant (tracked 360° or similar) is recommended to maintain the build programme. Breaking equipment may also be required locally to penetrate old foundations associated with former construction.
- 7.5.3 There are seven results for laboratory pH and sulphate tests for the made ground soils therefore the mean of the highest two results have been taken as the characteristic value.
- 7.5.4 The made ground materials on site are granular therefore the groundwater has been classed as mobile
- 7.5.5 The characteristic value for made ground for soluble sulphate is 0.1956g/l and the pH is 8.32. Total sulphur concentrations of 0.07% and Total sulphate concentrations of 0.13% indicate the ground is not pyritic.



- 7.5.6 There are only two results for natural sandstone therefore the highest measure sulphate concentrations has been taken as the characteristic value.
- 7.5.7 The characteristic value for sandstone for soluble sulphate is 0.1233g/l and pH is 8.05.
- 7.5.8 The results of laboratory pH and sulphate content indicate that AEC Class AC-1d and sulphate class DS-1 conditions prevail for both made ground and natural sandstone in accordance with BRE Special Digest 1 "Concrete in aggressive ground" 2005. The specific concrete mixes (the Design Concrete Class) to be used on site will be determined by the site specific concrete requirements in terms of the durability and structural performance. These are assessed in terms of the Structural Performance Level (SPL) and any need for Additional Protective Measures (APM) detailed in Part D of BRE Special Digest 1 with further guidance in Pt E and F.

7.6 Highways

- 7.6.1 CBR values of 1% are likely to be achieved in made ground soils for pavement design purposes, unless proven otherwise by in-situ testing at sub-base level by a specialist geotechnical engineer.
- 7.6.2 Some reengineering of the subgrade is required prior to highway construction to achieve the required design CBR value.

7.7 Soakaways

- 7.7.1 The use of soakaways is not recommended due to the presence of deep made ground across the site.



8.0 ENVIRONMENTAL ASSESSMENT

8.1 General

- 8.1.1 The level of protection for the clean potable water supply pipes should be determined using the local water company risk assessment criteria in accordance with UKWIR.

8.2 Contamination

Soils

- 8.2.1 On the basis of the testing undertaken to date it would appear that there is localised metal and PAH contamination in the made ground above residential without plant uptake screening values. The contamination identified is likely attributed to ash as a minor constituent in the ground.
- 8.2.2 Chrysotile asbestos fibres have also been detected in three samples tested to date in the ashy sand, sand and brick cobble made ground material.
- 8.2.3 No hydrocarbon contamination has been identified in the samples tested.

Permanent Ground Gases

- 8.2.4 In order to assess the ground gas situation and the requirement for ground gas precautionary measures at the site, guidance was taken from CIRIA C665 'Assessing risks posed by hazardous ground gases to buildings' and BS8485:2015 'Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'.
- 8.2.5 The proposed residential end use dictates that the gas monitoring results are assessed in accordance with CIRIA C665 and the Wilson and Card methodology. The Wilson and Card method uses the concept of a Gas Screening Value (GSV) which is calculated using the maximum concentration of ground gas and flow rate. A maximum positive flow of 0.2l/hr has been used to calculate the GSVs. The GSVs are then compared to the NHBC traffic light system to determine the risk category of the site and the need for gas protection measures.
- 8.2.6 The interim results generate a Gas Screening Value of 0.0002l/hr for carbon dioxide. No methane was detected at the site therefore a GSV cannot be calculated.
- 8.2.7 The GSV for carbon dioxide place the site the site into Characteristic Situation One however a full assessment will be issued on completion of the programme.

8.3 Qualitative Risk Assessment

- 8.3.5 The risk assessment methodology used in this instance is based on **Source – Pathway – Receptor** (SPR) philosophy. The **source** is the presence of contamination, or substance/event likely to cause harm. The **receptor** is the target that may be detrimentally affected by the source. The **pathway** is the means of

the contamination to move from the source to the receptor. Where any of these three factors are removed there is deemed to be no risk.

- 8.3.6 The CSMs have been revised based on the findings of the site investigation and laboratory testing results.

Human Health

Potential Source	Potential Pathway	Potential Receptor	Likelihood	Severity	Level of Risk
ON-SITE					
Made ground, (Heavy metals and PAH's)	Ingestion, direct contact, inhalation of dusts.	End-users	Unlikely	Medium	Low
Made ground (Ground gas)	Migration of gas into confined spaces	End-users	Unlikely	Medium	Moderate/Low
Hydrocarbons	Ingestion, direct contact, inhalation of vapours.	End-users	Unlikely	Medium	Low
Asbestos	Inhalation of fibres	End-users	Unlikely	Medium	Low

Human Health Justification

- 8.3.7 Elevated metals and PAHs have been detected in the made ground soils and are attributed to ash in the made ground. However the proposed development will cover the majority of the site therefore breaking the pathway to site end users. The risk from made ground and asbestos fibres is considered to be low.
- 8.3.8 There is not considered to be a source of hydrocarbon contamination and therefore the risk is considered to be low.
- 8.3.9 Gas monitoring is ongoing however no elevated levels of carbon dioxide or methane gas have been detected to date, the risk is considered to be moderate to low at this stage. A full assessment will be made on completion of the ground gas monitoring programme.

Controlled Waters

Potential Source	Potential Pathway	Potential Receptor	Likelihood	Severity	Level of Risk
Principal Aquifer	Migration through groundwater or granular soils	Controlled waters	Unlikely to low likelihood	Medium	Moderate/Low
River Medlock	Migration through groundwater or granular soils	Controlled waters	Unlikely to low likelihood	Medium	Moderate/Low



Controlled Waters Justification

- 8.3.10 Elevated metals and PAHs have been identified in the made ground soils on site however they are considered to be relatively immobile. No groundwater has been detected during the initial investigation and subsequent monitoring visits. The site will be covered in more hardstanding than it currently is which will further reduce infiltration. Leaching of contamination will not occur if made ground does not come into contact with groundwater.
- 8.3.11 Furthermore the installation of a new drainage system will further reduce the risk to controlled waters by limiting the leaching potential.

8.4 Remedial Measures

- 8.4.1 No remedial measures are required with respect to soils on site due to the presence of hardstanding across the majority of the site.
- 8.4.2 Where there are no areas of hardstanding present, a cover system and a warning membrane should be in place in areas of soft landscaping. It is recommended that a layer of clean soil 600mm thick is placed to act as a growing medium and to prevent undesirable soils being brought to the surface.
- 8.4.3 Gas monitoring is ongoing however results to date indicate no gas protection measures are required in the new residential development.
- 8.4.4 A watching brief should also be maintained during groundworks for any additional unidentified sources of contamination within soils or groundwater.

8.5 Asbestos

- 8.5.1 The investigation of asbestos issues within structures was beyond the scope of this report. However, guidance from UK Government indicates that asbestos should be assumed to be present in buildings unless proven otherwise.
- 8.5.2 Any asbestos within structures will require removal prior to re-development. This will need to be done by a suitably qualified experienced and licensed contractor, who ensures that adequate PPE is provided to operatives, and that all the relevant legislation is adhered to.
- 8.5.3 Asbestos fibres have been identified in three samples at the site with quantification analysis identifying these samples to be trace amounts. At these concentrations the liberation of fibres is considered to be unlikely and no specific precautionary measures with regards to asbestos are likely to be required at the site. The level of precautions required are at the discretion of the principal contractor on site however good site practices including minimising the generation of dusts should be adhered to and sufficient to mitigate against the risk from asbestos. In addition site personnel should have the risk communicated at the induction stage. It is recommended that the asbestos in construction materials assessment tool is used at the site to inform asbestos licensing and control measures.

8.5.4 All such works will need to be agreed with the regulatory bodies (HSE, LA)

8.5.5 Additional guidance is provided within the Guidance Note in Appendix E.

8.6 Health and Safety Issues

8.6.1 During the reclamation and construction phases of the site development it will be necessary to protect the health and safety of site personnel. The risk to construction and ground workers is assessed in the table below:

Potential Source	Potential Pathway	Potential Receptor	Likelihood	Severity	Level of Risk
ON-SITE					
Made Ground	Ingestion, direct contact, inhalation of dusts.	Construction Workers	Unlikely	Medium	Moderate/Low
Asbestos	Ingestion, direct contact, inhalation of dusts.	Construction Workers	Unlikely	Medium	Moderate/Low

Discussion

8.6.2 Trace levels of Chrysotile asbestos have been identified in three samples to date and trace levels asbestos are assumed across the site. The risk from asbestos should be highlighted in the method statements and site induction. If further evidence of asbestos is encountered in the soils, work should cease until asbestos control measures have been agreed and put in place.

8.6.3 The risk from made ground will be mitigated by standard PPE including gloves. Welfare facilities should be made available to wash before hand to mouth activities.

8.6.4 General guidance on these matters is given in the Health and Safety Executive (HSE) document "Protection of Workers and the General Public during the Redevelopment of Contaminated Land". In summary, the following measures are suggested to provide a minimum level of protection:

- All ground workers should be issued with the relevant protective clothing, footwear and gloves. These protective items should not be removed from the site and personnel should be instructed as to why and how they are to be used.
- Hand-washing and boot-washing facilities should be provided.
- Care should be taken to minimise the potential for off-site migration of contamination by the provision of dust suppression control and wheel cleaning equipment during the construction works.
- Good practices relating to personal hygiene should be adopted on the site.
- The contractor shall satisfy the Health and Safety Executive with regard to any other matters concerning the health, safety and welfare of persons on the site.



8.7 Waste

- 8.7.1 Details of how material should be classified for waste disposal are presented in Appendix F.
- 8.7.2 Waste Acceptance Criteria (WAC) testing was outside the scope of this investigation and the guidance given below is general.
- 8.7.3 If any gross hydrocarbon contaminated material is encountered during the construction phase, it is possible that this may be classified as hazardous and testing should be undertaken at that time.
- 8.7.4 Where it is necessary to dispose material off site it is recommended that materials are segregated and where necessary sufficient time is allowed to further classify the material properly, including discussion with landfill sites and waste transfer stations to find the best disposal route.
- 8.7.5 If the reuse of soils is proposed on the site this should be done in accordance with the CL:AIRE "Development Industry Code of Practice for the Definition of Waste" (CL:AIRE CoP). Further guidance is provided on this in Appendix G Any re-use scheme should be designed to minimise disposal costs.

8.8 Compliance

- 8.8.1 It is recommended that the approval of the Local Authority and is obtained for to the proposed remedial scheme prior to any irrevocable action being taken.



9.0 CONCLUSIONS

9.1 Summary

Environmental

9.1.1 The site has metal and PAH contamination in addition to trace levels of asbestos fibres in the made ground. The risk to site end users is considered to be low due to hardstanding. The implementation of a cover layer of clean topsoil will be required where no hardstanding is present.

9.1.2 The risk to groundwater is considered to be moderate to low.

9.1.3 No ground gas has been identified on site and the risk is considered to be low at this stage, however gas monitoring is ongoing and a full assessment will be submitted on completion of the monitoring programme

Geotechnical

9.1.4 The most suitable foundations are considered to be piles founding in rock sockets in the sandstone at depths of around 4.00-5.00m bgl with a suspended floor slab.

9.1.5 Due to the seven storey development measures are required to satisfy Equilibrium Limit State conditions in the form of anchors.

9.1.6 The site lies in a Coal Mining Area however there has been no past mining at the site. Coal is likely to exist beneath the site however it is unlikely that coal will be worked in the future.

9.1.7 The use of soakaways at the site are not considered feasible due to the deep made ground.

9.2 Further Work

9.2.1 The following further work is considered necessary to progress the site to construction phase:

- Completion of gas monitoring programme.
- Issue gas assessment.
- Design of remedial strategy if required.
- Foundation design
- Confirmation of recommendations made with the Local Authority



10.0 REFERENCES

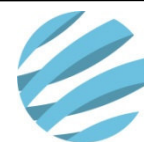
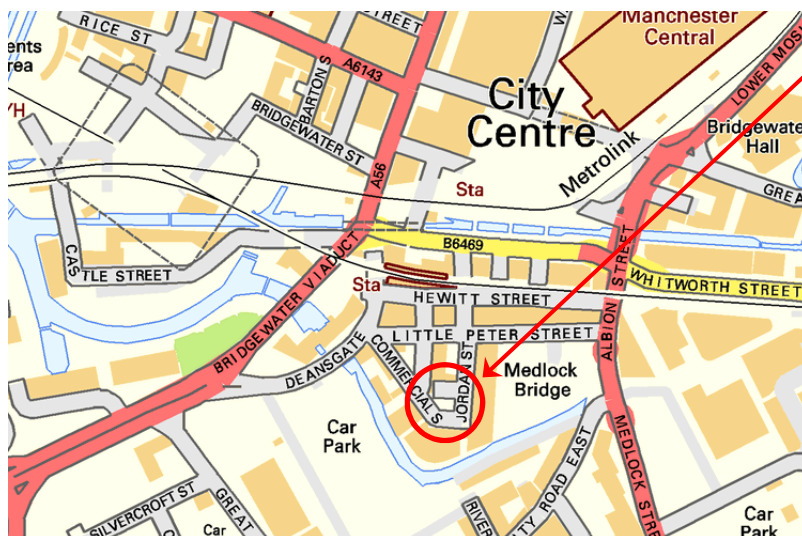
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DRAWINGS



SITE



**BROWNFIELD
SOLUTIONS LTD**
GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

**BEECH
CONSTRUCTION**
Jordan Street,
Manchester

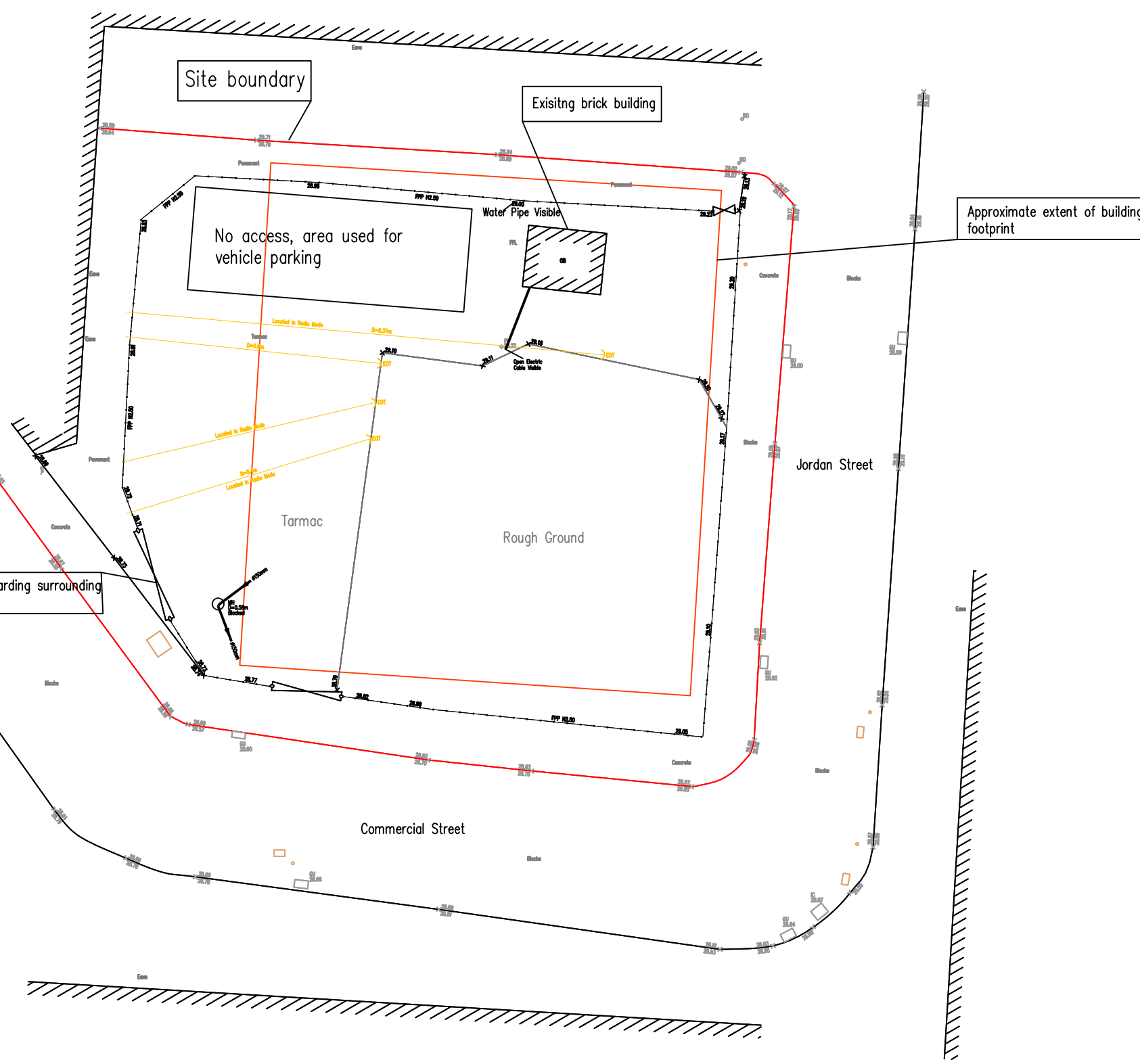
Site Location Plan

Drawing Number C3512/01

Scale: NTS

Drawn By: JMC

Checked By: JD

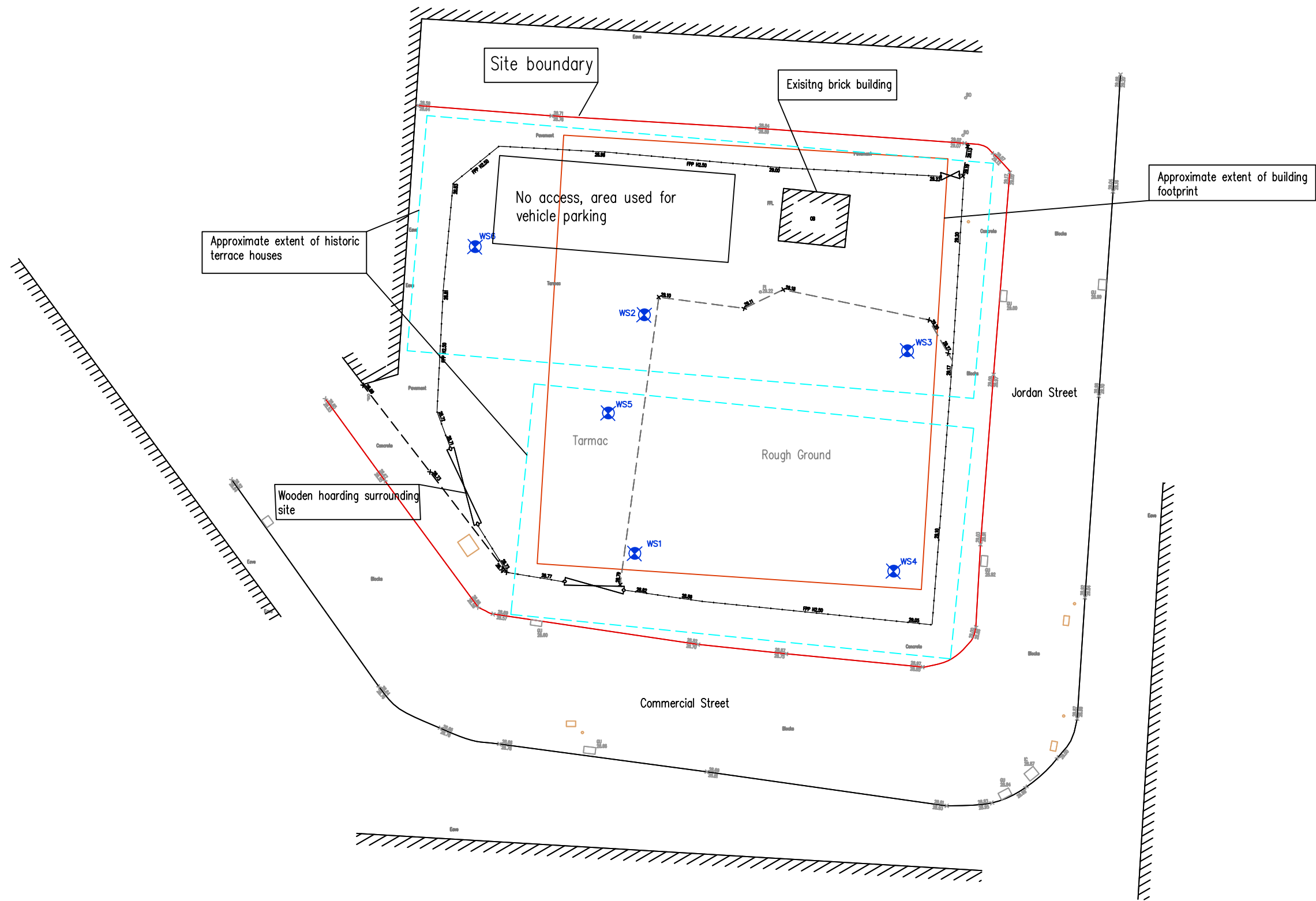


DESCRIPTION	REV	DATE
 BROWNFIELD SOLUTIONS LTD GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE		
CLIENT BEECH CONSTRUCTION		
PROJECT TITLE JORDAN STREET, MANCHESTER		
DRAWING DETAIL PERTINENT SITE FEATURES PLAN		
DRAWN JMC	CHECKED DRAFT	
DATE March 2017	SCALE 1:200 @ A3	
DRAWING NUMBER C3512/02		REVISION —



Key

 Window sample borehole



DESCRIPTION		REV	DATE
 BROWNFIELD SOLUTIONS LTD GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE			
CLIENT BEECH CONSTRUCTION			
PROJECT TITLE JORDAN STREET, MANCHESTER			
DRAWING DETAIL EXPLORATORY HOLE LOCATION PLAN			
DRAWN	JMC	CHECKED	JD
DATE	APRIL 2017	SCALE	1:200@A3
DRAWING NUMBER C3512/03			REVISION —

APPENDIX A

Exploratory Hole Logs



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

Borehole Log

Borehole No.

WS1

Sheet 1 of 1

Project Name: JORDAN STREET

Project No.
C3512

Co-ords: -

Hole Type
WS

Location: MANCHESTER

Level:

Scale
1:25

Client: BEECH CONSTRUCTION

Dates: 09/03/2017 -

Logged By
JC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.40	ES	N=9 (1,1/2,2,2,3)	0.80			MADE GROUND: Black ashy gravelly fine to coarse sand. Gravel is angular fine to coarse of mixed lithologies including slate, brick, coal, clinker and ceramic.	1
		1.00 1.00 1.00	D ES		1.50			MADE GROUND: Orange brown gravelly fine to coarse sand with medium cobble content. Gravel is angular fine to coarse of mixed lithologies including brick. Cobbles are angular of brick and sandstone. Rare pockets of black ashy sand.	
		1.60	ES		1.80			MADE GROUND: Brown slightly gravelly fine to coarse sand. Gravel is angular to subrounded fine to coarse of brick and masonry.	
		2.00 2.00 2.00	D ES	N=14 (1,0/1,4,4,5)	2.00			MADE GROUND: Light brown gravelly sand. Gravel is angular to subrounded fine to coarse of brick. Slightly clayey locally.	2
								MADE GROUND: Dark brown ashy gravelly sand with low to medium cobble content. Gravel is angular fine to coarse of brick. Cobbles are angular of brick.	
		3.00 3.00	D	N=33 (2,4/9,10,9,5)	3.70				3
					3.90				
		4.00 4.00	D		4.15			Light brown gravelly fine to medium SAND. Gravel is angular to subrounded fine to coarse of mixed lithologies including sandstone and siltstone. (Possible residual bedrock).	
								Weak grey brown SANDSTONE highly weathered recovered as gravelly sand.	4
								End of borehole at 4.15 m	

Remarks

1. Hand dug pit to 1.20m bgl.
2. No groundwater encountered.
3. Standpipe installed to 3.00m bgl; 1.00m plain, 2.00m slotted.





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

Borehole Log

Borehole No.

WS2

Sheet 1 of 1

Project Name: JORDAN STREET

Project No.
C3512

Co-ords: -

Hole Type
WS

Location: MANCHESTER

Level:

Scale
1:25

Client: BEECH CONSTRUCTION

Dates: 09/03/2017 -

Logged By
JC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10	ES	N=1 (1,0/0,1,0,0)	0.20			MADE GROUND: Black ashy gravelly fine to coarse sand. Gravel is angular fine to coarse of mixed lithologies including slate and brick.	
								MADE GROUND: Cobbles and angular fine to coarse gravel of brick.	
		0.80	ES					<u>Black ashy sand from 0.80m.</u>	
		1.00	D	N=6 (7,6/2,2,1,1)	1.00			MADE GROUND: Orange brown sandy angular fine to coarse gravel of mixed lithologies including brick and masonry.	
		1.00							
		1.50	ES						
		1.80	ES	50 (75 for 90mm/50 for 40mm)	1.90			<u>Ashy from 1.70m to 1.80m.</u>	
		2.00	D					MADE GROUND: Brown clayey gravelly fine to coarse sand. Gravel is angular fine to coarse of mixed lithologies including brick.	
		2.00							
		2.30	ES		2.40			MADE GROUND: Brown soft to firm slightly gravelly clay with low to medium cobble content. Gravel is angular fine to coarse of slate and brick.	
		2.50	ES		2.70				
		2.60							
		2.70	D					End of borehole at 2.70 m	

Remarks

1. Hand dug pit to 1.20m bgl.
2. No groundwater encountered.
3. Standpipe installed to 2.50m bgl; 1.00m plain, 1.50m slotted.







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

Borehole Log

Borehole No.

WS4

Sheet 1 of 1

Project Name: JORDAN STREET

Project No.
C3512

Co-ords: -

Hole Type
WS

Location: MANCHESTER

Level:

Scale
1:25

Client: BEECH CONSTRUCTION

Dates: 09/03/2017 -

Logged By
JC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.50	ES					MADE GROUND: Dark brown gravelly sand with low to medium cobble content. Slightly ashy locally, gravel is angular fine to coarse of brick. Cobbles are angular of brick.	
		1.00	D						
		1.00	ES						
		1.00		N=2 (1,0/0,1,0,1)				Coal gravel from 1.00m.	1
		2.00		N=5 (2,1/1,1,1,2)					2
		2.30	ES						
		3.00	D						3
		3.00		N=10 (0,1/1,2,2,5)					
		3.30	ES						
		4.00	D						4
		4.00		65 (13,13/30,35,,)	4.10			Weak red brown SANDSTONE highly weathered recovered as gravelly sand.	
					4.30			End of borehole at 4.30 m	
									5

Remarks

- Hand dug pit to 1.20m bgl.
- No groundwater encountered.
- Standpipe installed to 4.00m bgl; 1.00m plain, 3.00m slotted.





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

Borehole Log

Borehole No.

WS5

Sheet 1 of 1

Project Name: JORDAN STREET

Project No.
C3512

Co-ords: -

Hole Type
WS

Location: MANCHESTER

Level:

Scale
1:25

Client: BEECH CONSTRUCTION

Dates: 09/03/2017 -

Logged By
JC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.15			MADE GROUND: Black ashy gravelly fine to coarse sand. Gravel is medium to coarse of mixed lithologies including coal and clinker.	
					0.30			MADE GROUND: Light brown gravelly sand with low to medium cobble content. Gravel is angular to subrounded fine to coarse of brick. Cobbles are angular of brick.	
		0.40	ES		0.40			MADE GROUND: Dark brown slightly gravelly fine to coarse sand. Gravel is angular of mixed lithologies including brick.	
		0.65	ES		0.60			MADE GROUND: Black ashy gravelly fine to coarse sand. Gravel is medium to coarse of mixed lithologies including coal and clinker.	
		1.00	D	N=0 (1,0/0,0,0,0)	1.00			MADE GROUND: Brown slightly gravelly fine to coarse sand. Gravel is angular to subrounded of mixed lithologies including coal, brick and clinker and rare plastic.	1
		1.00						MADE GROUND: Dark brown slightly gravelly fine to coarse sand. Gravel is angular fine to coarse of mixed lithologies including brick.	
		1.50	ES						
		2.00	D	N=12 (2,1/1,4,3,4)				Clayey from 1.90m.	2
		2.00							
		2.50	ES						
		3.00	D	N=20 (2,1/1,6,6,7)	3.00			Brick cobbles form 2.90m.	3
		3.00						MADE GROUND: Light brown slightly gravelly fine to coarse sand. Gravel is angular to subrounded fine to coarse of mixed lithologies including brick.	
		3.50	ES		3.50			Light brown gravelly fine to medium SAND. Gravel is angular to subrounded fine to coarse of mixed lithologies including sandstone and quartzite. (Possible residual bedrock).	
		3.80	D	72 (15,20/72 for 275mm)	3.80			Weak red brown SANDSTONE highly weathered recovered as gravelly sand.	
		3.80			4.00			End of borehole at 4.00 m	4
									5

Remarks

1. Hand dug pit to 1.20m bgl.
2. No groundwater encountered.
3. Hole backfilled upon completion.





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

Borehole Log

Borehole No.

WS6

Sheet 1 of 1

Project Name: JORDAN STREET

Project No.
C3512

Co-ords: -

Hole Type
WS

Location: MANCHESTER

Level:

Scale
1:25

Client: BEECH CONSTRUCTION

Dates: 09/03/2017 -

Logged By
JC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES		0.20			MADE GROUND: Dark brown clayey gravelly sand. Gravel is angular to subrounded fine to coarse of mixed lithologies.	
					0.37			MADE GROUND: Black ashy sandy angular to subrounded fine to coarse gravel of mixed lithologies including clinker and brick	
					0.47			MADE GROUND: Light brown gravelly fine to coarse sand. Gravel is angular to subrounded fine to medium of mixed lithologies including masonry.	
		0.60	ES	N=4 (1,1/1,1,1,1)				MADE GROUND: Dark brown slightly clayey gravelly fine to coarse sand with low cobble content. Locally sandy clay. Gravel is angular of mixed lithologies including brick. Cobbles are angular of brick and masonry.	
		1.00	D						
		1.00							
		1.60	ES	N=2 (1,0/1,0,1,0)					
		2.00	D						
		2.00							
		2.20	ES						
		3.00	D	N=1 (1,0/0,1,0,0)					
		3.00							
		3.20	ES						
		3.80	D	50 (16,20/50 for 230mm)	3.80				
		4.00	D		3.90			Light brown gravelly fine to medium SAND. Gravel is angular to subrounded fine to coarse of mixed lithologies including sandstone and quartzite. (Possible residual bedrock).	
		4.00						Weak red brown SANDSTONE highly weathered recovered as gravelly sand.	
					4.30			End of borehole at 4.30 m	

Remarks

1. Hand dug pit to 1.20m bgl.
2. No groundwater encountered.
3. Hole backfilled upon completion.





APPENDIX B Testing Results



Exova Jones Environmental

Registered Address : Exova (UK) Ltd, Lochend Industrial Estate, Newbridge, Midlothian, EH28 8PL

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

Brownfield Solutions Limited
173-183 Witton Street
Northwich
Cheshire
CW9 5LP

Tel: +44 (0) 1244 833780

Fax: +44 (0) 1244 833781



Attention :	Jo Campion
Date :	29th March, 2017
Your reference :	C3512
Our reference :	Test Report 17/5306 Batch 1
Location :	Jordan Street
Date samples received :	11th March, 2017
Status :	Final report
Issue :	2

Thirty two samples were received for analysis on 11th March, 2017 of which seven were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied. All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Bruce Leslie
Project Co-ordinator

Client Name: Brownfield Solutions Limited
Reference: C3512
Location: Jordan Street
Contact: Jo Campion
JE Job No.: 17/5306

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	1-3	10	17-19	26-27	46-48	52-54	72-74				Please see attached notes for all abbreviations and acronyms		
Sample ID	WS1	WS1	WS2	WS2	WS4	WS4	WS6						
Depth	0.40	2.00	0.80	2.50	1.00	3.30	0.60						
COC No / misc													
Containers	V J T	J	V J T	V J	V J T	V J T	V J T						
Sample Date	09/03/2017	09/03/2017	09/03/2017	09/03/2017	09/03/2017	09/03/2017	09/03/2017						
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil						
Batch Number	1	1	1	1	1	1	1						
Date of Receipt	11/03/2017	11/03/2017	11/03/2017	11/03/2017	11/03/2017	11/03/2017	11/03/2017				LOD/LOR	Units	Method No.
Arsenic #	-	-	-	-	31.2	-	-				<0.5	mg/kg	TM30/PM15
Arsenic	7.3	-	21.9	-	-	-	21.2				<0.5	mg/kg	TM30/PM62
Cadmium #	-	-	-	-	0.8	-	-				<0.1	mg/kg	TM30/PM15
Cadmium	0.9	-	0.4	-	-	-	<0.1				<0.1	mg/kg	TM30/PM62
Chromium #	-	-	-	-	44.7	-	-				<0.5	mg/kg	TM30/PM15
Chromium	13.6	-	16.9	-	-	-	13.1				<0.5	mg/kg	TM30/PM62
Copper #	-	-	-	-	2335 ^{AA}	-	-				<1	mg/kg	TM30/PM15
Copper	79	-	105	-	-	-	109				<1	mg/kg	TM30/PM62
Lead #	-	-	-	-	1057	-	-				<5	mg/kg	TM30/PM15
Lead	144	-	405	-	-	-	136				<5	mg/kg	TM30/PM62
Mercury #	-	-	-	-	0.5	-	-				<0.1	mg/kg	TM30/PM15
Mercury	<0.1	-	0.6	-	-	-	0.4				<0.1	mg/kg	TM30/PM62
Nickel #	-	-	-	-	26.9	-	-				<0.7	mg/kg	TM30/PM15
Nickel	16.8	-	16.7	-	-	-	21.1				<0.7	mg/kg	TM30/PM62
Selenium #	-	-	-	-	<1	-	-				<1	mg/kg	TM30/PM15
Selenium	<1	-	<1	-	-	-	<1				<1	mg/kg	TM30/PM62
Sulphur as S	-	0.07	-	0.05	-	0.02	-				<0.01	%	TM30/PM15
Total Sulphate as SO4 BRE	-	0.13	-	0.04	-	0.02	-				<0.01	%	TM50/PM29
Zinc #	-	-	-	-	1327	-	-				<5	mg/kg	TM30/PM15
Zinc	262	-	144	-	-	-	81				<5	mg/kg	TM30/PM62
PAH MS													
Naphthalene #	<0.20 ^{AA}	-	0.23	-	<0.04	-	<0.04				<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.15 ^{AA}	-	0.23	-	0.06	-	0.05				<0.03	mg/kg	TM4/PM8
Acenaphthene #	1.39 ^{AA}	-	0.26	-	<0.05	-	<0.05				<0.05	mg/kg	TM4/PM8
Fluorene #	0.74 ^{AA}	-	0.25	-	<0.04	-	<0.04				<0.04	mg/kg	TM4/PM8
Phenanthrene #	9.31 ^{AA}	-	3.11	-	0.40	-	0.21				<0.03	mg/kg	TM4/PM8
Anthracene #	3.81 ^{AA}	-	0.64	-	0.12	-	0.07				<0.04	mg/kg	TM4/PM8
Fluoranthene #	17.67 ^{AA}	-	6.18	-	0.55	-	0.69				<0.03	mg/kg	TM4/PM8
Pyrene #	15.15 ^{AA}	-	6.72	-	0.54	-	0.81				<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	7.77 ^{AA}	-	3.43	-	0.35	-	0.51				<0.06	mg/kg	TM4/PM8
Chrysene #	8.96 ^{AA}	-	4.40	-	0.33	-	0.54				<0.02	mg/kg	TM4/PM8
Benzo(b)fluoranthene #	13.70 ^{AA}	-	3.65	-	0.45	-	0.79				<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	9.10 ^{AA}	-	2.10	-	0.31	-	0.56				<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene #	5.54 ^{AA}	-	0.82	-	0.17	-	0.27				<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	1.18 ^{AA}	-	0.28	-	<0.04	-	0.07				<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	5.37 ^{AA}	-	0.76	-	0.17	-	0.29				<0.04	mg/kg	TM4/PM8
PAH 16 Total	99.7 ^{AA}	-	33.1	-	3.5	-	4.9				<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	9.86 ^{AA}	-	2.63	-	0.32	-	0.57				<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	3.84 ^{AA}	-	1.02	-	0.13	-	0.22				<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	109 ^{AA}	-	115	-	108	-	108				<0	%	TM4/PM8
EPH (C8-C40) #	-	-	309	-	176	-	-				<30	mg/kg	TM5/PM8

Please see attached notes for all abbreviations and acronyms

Matrix : Solid

Client Name: Brownfield Solutions Limited
Reference: C3512
Location: Jordan Street
Contact: Jo Campion

Note:

Analysis was carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Samples are retained for not less than 6 months from the date of analysis unless specifically requested.

Opinions, including ACM type and Asbestos level, lie outside the scope of our UKAS accreditation.

Where the sample is not taken by a Jones Environmental Laboratory consultant, Jones Environmental Laboratory cannot be responsible for inaccurate or unrepresentative sampling.

Signed on behalf of Jones Environmental Laboratory:



Ryan Butterworth
 Asbestos Team Leader

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Date Of Analysis	Analysis	Result
17/5306	1	WS1	0.40	2	15/03/2017	General Description (Bulk Analysis)	Soil/Stone/Silt
					15/03/2017	Asbestos Fibres	Fibre Bundles
					15/03/2017	Asbestos ACM	NAD
					15/03/2017	Asbestos Type	Chrysotile
					15/03/2017	Asbestos Level Screen	<0.1%
					29/03/2017	Asbestos Gravimetric Quantification	<0.001 (mass %)
					29/03/2017	Asbestos PCOM Quantification (Fibres)	<0.001 (mass %)
					29/03/2017	Asbestos Gravimetric & PCOM Total	<0.001 (mass %)
17/5306	1	WS2	0.80	18	15/03/2017	General Description (Bulk Analysis)	Soil/Stone/Silt
					15/03/2017	Asbestos Fibres	Fibre Bundles
					15/03/2017	Asbestos ACM	NAD
					15/03/2017	Asbestos Type	Chrysotile
					15/03/2017	Asbestos Level Screen	<0.1%
					29/03/2017	Asbestos Gravimetric Quantification	<0.001 (mass %)
					29/03/2017	Asbestos PCOM Quantification (Fibres)	<0.001 (mass %)
					29/03/2017	Asbestos Gravimetric & PCOM Total	<0.001 (mass %)
17/5306	1	WS4	1.00	47	15/03/2017	General Description (Bulk Analysis)	Soil/Stone/Silt
					15/03/2017	Asbestos Fibres	NAD
					15/03/2017	Asbestos Fibres (2)	NAD
					15/03/2017	Asbestos ACM	NAD
					15/03/2017	Asbestos ACM (2)	NAD
					15/03/2017	Asbestos Type	NAD
					15/03/2017	Asbestos Type (2)	NAD
					15/03/2017	Asbestos Level Screen	NAD
17/5306	1	WS6	0.60	73	15/03/2017	General Description (Bulk Analysis)	Soil/Stone
					15/03/2017	Asbestos Fibres	Fibre Bundles
					15/03/2017	Asbestos ACM	NAD
					15/03/2017	Asbestos Type	Chrysotile
					15/03/2017	Asbestos Level Screen	<0.1%
					29/03/2017	Asbestos Gravimetric Quantification	<0.001 (mass %)
					29/03/2017	Asbestos PCOM Quantification (Fibres)	<0.001 (mass %)
					29/03/2017	Asbestos Gravimetric & PCOM Total	<0.001 (mass %)

Matrix : Solid

[illegible]

Client Name: Brownfield Solutions Limited

Reference: C3512

Location: Jordan Street

Contact: Jo Champion

[illegible]

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 17/5306

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS) accredited - UK.
SA	ISO17025 (SANAS) accredited - South Africa.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x5 Dilution

JE Job No: 17/5306

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.				
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM21	Modified USEPA 415.1. Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO ₂ generated is quantified using infra-red detection.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.			AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21	As received solid or water samples are extracted in Methanol: Sodium Hydroxide (0.1M NaOH) (60:40) by orbital shaker.			AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7 and 6010B	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7 and 6010B	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes

JE Job No: 17/5306

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7 and 6010B	PM62	Acid digestion of as received solid samples using Aqua Regia refluxed at 112.5 °C.			AR	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM60	As received solid samples are extracted with deionised water in a 2:1 ratio of water to solid.			AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	Dried and ground solid sample is boiled with dilute hydrochloric acid, the resulting liquor is then analysed.			AD	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.			AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.			AR	
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide and Thiocyanate analysis.	Yes		AR	Yes



Exova Jones Environmental

Registered Address : Exova (UK) Ltd, Lochend Industrial Estate, Newbridge, Midlothian, EH28 8PL

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Cheshire
CW9 5LP

Tel: +44 (0) 1244 833780

Fax: +44 (0) 1244 833781



Attention :	Sam Flaherty
Date :	20th March, 2017
Your reference :	C3512
Our reference :	Test Report 17/5382 Batch 1
Location :	Jordan St
Date samples received :	14th March, 2017
Status :	Final report
Issue :	1

Eleven samples were received for analysis on 14th March, 2017 of which two were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Phil Sommerton BSc
Project Manager

Please see attached notes for all abbreviations and acronyms

Client Name: Brownfield Solutions Limited

Reference: C3512

Location: Jordan St

Contact: Sam Flaherty

[illegible]

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 17/5382

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If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

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The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

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Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

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As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

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DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

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SA	ISO17025 (SANAS) accredited - South Africa.
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DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

JE Job No: 17/5382

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No



APPENDIX C

Interim Gas Monitoring Results

05/04/2017

**BROWNFIELD
SOLUTIONS LTD**
GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

	Percentage Concentrations				Parts per Million		mb				
Ambient	Oxygen (O ₂)	Carbon Dioxide (CO ₂)	Methane (CH ₄)	LEL	Hydrogen Sulphide (H ₂ S)	Carbon Monoxide (CO)	Atm Pressure	Monitored by	Equipment	Weather	Pressure Trend
Start	21.5	0.1	0.1		ND	ND	1029	JB	GA5000	Sunny	Rising
Finish	21.5	0.1	0.1		ND	ND	1029				

		Percentage Concentrations				Parts Per Million		m bgl	litres/hour	mb			litres/hour	litres/hour	
Location	State (Peak/Steady)	Oxygen (O ₂)	Carbon Dioxide (CO ₂)	Methane (CH ₄)	LEL	Hydrogen Sulphide (H ₂ S)	Carbon Monoxide (CO)	Water Level	Flow	Relative Pressure	Sheen (Y/N)		Q _{hg} CO ₂	Q _{hg} CH ₄	Notes
WS1	Peak	21.4	ND	ND	ND	ND	ND	NGW	0.0	-0.1					
	Steady	21.5	ND	ND	ND	ND	ND								
WS2	Peak	21.4	ND	ND	ND	ND	ND	NGW	0.1	-0.1					
	Steady	21.4	ND	ND	ND	ND	ND								
WS4	Peak	21.3	0.1	ND	ND	ND	ND	NGW	0.2	0.0					
	Steady	21.5	ND	ND	ND	ND	ND								

APPENDIX D

Contaminated Land Screening Values

Contaminated Land Screening Values

In assessing the potential for contamination Brownfield Solutions Limited (BSL) follows UK guidance and current best practice.

General

The current recommended method for assessing contamination is on the basis of:

Source-Pathway-Receptor

Where any one of these “pollution linkages” is absent there is deemed to be no risk.

Fundamentally receptors can be considered as humans and controlled waters (surface and ground waters).

The purpose of using Tier 1 screening levels is to have a simple means of assessing the potential contamination of a site and to inform decisions on whether further investigation is warranted or whether an option to undertake clean up based on the data to hand is cost effective.

Human Health

Current UK guidance is provided by DEFRA and the Environment Agency (EA). Publications forming part of the guidance include; CLEA Model, toxicological reports and soil guideline values (SGV), collectively referred to as the CLEA Guidance. The CLEA Guidance has included a number of publications which have provided initial screening values for soil contamination based on standard land uses and soil assumptions.

CLEA guidance has gone through a number of revisions, all of the original SGV's that were published have been withdrawn and publication of new SGV's commenced in 2009.

For determinands where no SGVs are available, S4UL values have been published using the CLEA 1.06 Model. These are the third set of generic assessment criteria generated by CIEH, and replace the previous two sets of GACs. The revised S4UL values are based on greater knowledge of relevant toxicology and further consideration of exposure frequencies.

No SGV or S4UL is available for lead as this is derived based on blood lead levels. C4SL values for six determinands including lead was published by DEFRA/CL:AIRE in December 2014 and they represent a low risk as opposed to minimal risk. The C4SL values are based on a sandy loam with 6% Soil Organic Matter. These screening values were published by DEFRA for Part 2A use, although with the dual purpose for use under planning. However these have not been officially accepted by Local Government for use under planning. S4ULs remain the first reference due to the broader range of end uses and soil organic content.

The preference from the EA is that site specific screening levels are used wherever possible. Due to numerous factors it is not always possible to utilise site specific values. In these instances the following data sources are used in the order of preference given below:

- Current UK SGV's
- CIEH S4UL values (derived by CIEH/LQM)
- DEFRA/CL:AIRE C4SL's
- CL:AIRE GAC values
- Guidance from other European countries
- Guidance from the outside Europe.

Controlled Waters

The European Water Framework Directive (WFD) became UK law in December 2003. It was created to ensure that European countries manage their rivers, groundwater and lakes so that they stay healthy for people and for wildlife.

This is achieved by the use of chemical standards for surface waters and groundwater. These values describe concentrations of chemicals that are not expected to cause harm to environmental organisms or human health, provided they are not exceeded. The same chemical may have several standards for different environmental regimes, and for different protection objectives.

Statutory Standards are set in legislation and if exceeded, this constitutes non-compliance with statutory obligations. European Directives are implemented in England and Wales by corresponding statutory instruments (i.e. regulations). The statutory instruments can be the exact same standards as they appear in the Directive or be more stringent.

A number of non-statutory standards also exist, these are set by various organisations (including the EA) for chemicals that are considered to be of concern, but are not covered by any specific legislation.

The chemical standards used in the UK to control impact of contamination on controlled waters are Environmental Quality Standards (EQS). The EQS's cover a large number of compounds.

Where certain compounds are not covered by the EQS these are commonly compared to the UK Drinking Water Standards (DWS).

Further Assessment

When screening values are exceeded then further consideration is required. This could include the use of simple measures to break the pollution pathway and mitigate the risk, further more detailed investigation, including the deriving of site specific values to better define the risk and to design appropriate remedial measures.



APPENDIX E

Contaminated Land Legislative Background

Legislative Background

Environmental liabilities and risks have been evaluated in terms of a source -pathway - target relationship in accordance with the approach set out in:

- The 1995 Environment Act;
- The Contaminated Land (England) Regulations 2000;
- The DETR circular 02/2000 Environmental Protection Act 1990: Part IIA Contaminated Land.

Contaminated land is defined within the legislative framework as land which is in such condition by reason of substances in, on or under the land that:

- 1) Significant harm is being caused or there is a significant possibility of such harm being caused;
- 2) Significant pollution of controlled waters is being or is likely to be caused.

The potential for harm is based on the presence of three factors:

- **Source** - substances that are potential contaminants or pollutants that may cause harm;
- **Pathway** - a potential route by which contaminants can move from the source to the receptor;
- **Receptor** - a receptor that may be harmed, for example the water environment, humans and water.

Where a source, pathway and target are all present a pollutant linkage exists and there is potential for harm to be caused. The presence of a source does not automatically imply that a contamination problem exists, since contamination must be defined in terms of pollutant linkages and unacceptable risk of harm. The nature and importance of both pathways and receptors are site specific and will vary according to the intended end use of the site, its characteristics and its surroundings.

The key principle which supports the SPR approach is 'suitable for use' criteria. This requires remedial action only where contamination is considered to pose unacceptable actual or potential risks to health or the environment and, taking into account the proposed use of the site.

Relevant Guidance Documents

This report has been prepared in accordance with the list of guidance below however the list is not exhaustive:

- CLR11 – Model Procedures;
- Contamination and Environmental Matters - Their implications for Property Professionals (2nd Edition RICS Nov 2003);
- Brownfields – Managing the development of previously developed land – A client's guide, CIRIA 2002;
- DEFRA and Environment Agency publications CLR7 – 10, supported by the TOX guides and SGV guides, dated March 2002;
- DETR Circular 02/2000, Contaminated Land: Implementation of Part IIA of the Environmental Protection Act 1990;
- Environment Agency technical advice to third parties on Pollution of Controlled Waters for Part IIA of the EPA1990, May 2002;

Relevant Legislative Documents

The following is a non-exhaustive list of legislative framework documents that has been considered in the production of this report:

- The Environment Act (1995);
- The Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance (2012);
- The Environment Protection Act (1990);
- The Contaminated Land (England) Act (2000);
- Contaminated Land (England) Regulations (2012);
- The Water Resources Act (1991);
- The Pollution Prevention and Control (England and Wales) Regulations (2000);
- The Landfill Regulations (England and Wales) Regulations (2002);
- The Landfill (England and Wales) (Amendment) Regulations (2004);
- Health and Safety at Work Act;



APPENDIX F

CIRIA Risk Assessment Methodology

Contaminated Land Risk Assessment

Contaminated Land Risk Assessment is a technique that identifies and considers the associated risk, determines whether the risks are significant and whether action needs to be taken. The four main stages of risk assessment are:

Hazard Identification ➡ Hazard Assessment ➡ Risk Estimation ➡ Risk Evaluation

CLR11 outlines the framework to be followed for risk assessment in the UK. The framework is designed to be consistent with UK legislation and policies including planning. The starting point of the risk assessment is to identify the context of the problem and the objectives of the process. Under CLR11, three tiers of risk assessment exist - Preliminary, Generic Quantitative and Detailed Quantitative.

Formulating and developing a conceptual model for the site is an important requirement of risk assessment, this supports the identification and assessment of pollutant linkages. Development of the conceptual model forms the main part of preliminary risk assessment, and the model is subsequently refined or revised as more information and understanding is obtained through the risk assessment process.

Risk is a combination of the likelihood of an event occurring and the magnitude of its consequences. Therefore, both the likelihood and the consequences of an event must be taken into account when assessing risk.

The risk assessment process needs to take into account the degree of confidence required in decisions. Identification of uncertainties is an essential step in risk assessment.

The likelihood of an event is classified on a four-point system using the following terms and definitions from CIRIA C552:

- **High likelihood:** There is a pollution linkage and an event appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution;
- **Likely:** There is a pollution linkage and all the elements are present and in the right place, which means it is probable that an event will occur. Circumstances are such that the event is not inevitable, but possible in the short term and likely over the long term;
- **Low likelihood:** There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain even over a longer period such event would take place, and is less likely in the short term;
- **Unlikely:** There is a pollution linkage but circumstances are such that it is improbable the event would occur even in the long term.

The severity is also classified using a system based on CIRIA C552. The terms and definitions are:

- **Severe:** Short term (acute) risk to human health likely to result in 'significant harm' as defined by the Environment Protection Act 1990, Part IIA. Short-term risk of pollution of sensitive water resources. Catastrophic damage to buildings or property. A short-term risk to a particular ecosystem or organism forming part of that ecosystem (note definition of ecosystem in 'Draft Circular on Contaminated Land', DETR 2000);
Examples – High concentrations of contaminant on surface of recreation area, major spillage of contaminants from site into controlled waters, explosion causing building to collapse;
- **Medium:** Chronic damage to human health ('significant harm' as defined in DETR 2000). Pollution of sensitive water resources. A significant change in a particular ecosystem or organism forming part of that ecosystem (note definition of ecosystem in 'Draft Circular on Contaminated Land', DETR 2000);
Examples - Concentrations of contaminants exceed the generic assessment criteria, leaching of contaminants from a site to a Principal or Secondary Aquifer, death of species within a designated nature reserve;
- **Mild:** Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services ('significant harm' as defined in 'Draft Circular on Contaminated Land', DETR 2000). Damage to sensitive buildings, structures, services or the environment;
Examples – Pollution of non-classified groundwater or damage to buildings rendering it unsafe to occupy.
- **Minor:** harm, not necessarily significant harm, which may result in financial loss or expenditure to resolve. Non-permanent health effects to human health (easily prevented by use of personal protective clothing etc). Easily repairable effects of damage to buildings, structures and services.
Examples – Presence of contaminants at such concentrations PPE is required during site work, loss of plants in landscaping scheme or discolouration of concrete.

Once the likelihood and severity have been determined, a risk category can be assigned using the table below.

		Consequences			
		Severe	Medium	Mild	Minor
Probability	Highly likely	Very high	High	Moderate	Moderate/low
	Likely	High	Moderate	Moderate/low	Low
	Low likelihood	Moderate	Moderate/low	Low	Very low
	Unlikely	Moderate/low	Low	Very Low	Very low

Definitions of the risk categories obtained from the above table are as follows together with an assessment of the further work that might be required:

- **Very high:** There is a high probability that severe harm could arise to a designated receptor from an identified hazard or there is evidence that severe harm is currently happening. This risk, if realised, could result in substantial liability. Urgent investigation and remediation are likely to be required;
- **High:** Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation is required and remedial works may be necessary in the short term and are likely over the longer term;
- **Moderate:** It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it would be more likely to be relatively mild. Investigation is normally required to clarify the risk and determine the liability. Some remedial works may be required in the longer term;
- **Low:** It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild;
- **Very Low:** There is a low possibility that harm could arise to a receptor. In the event of such harm being realised, it is not likely to be severe.



APPENDIX G
Asbestos Guidance Notes

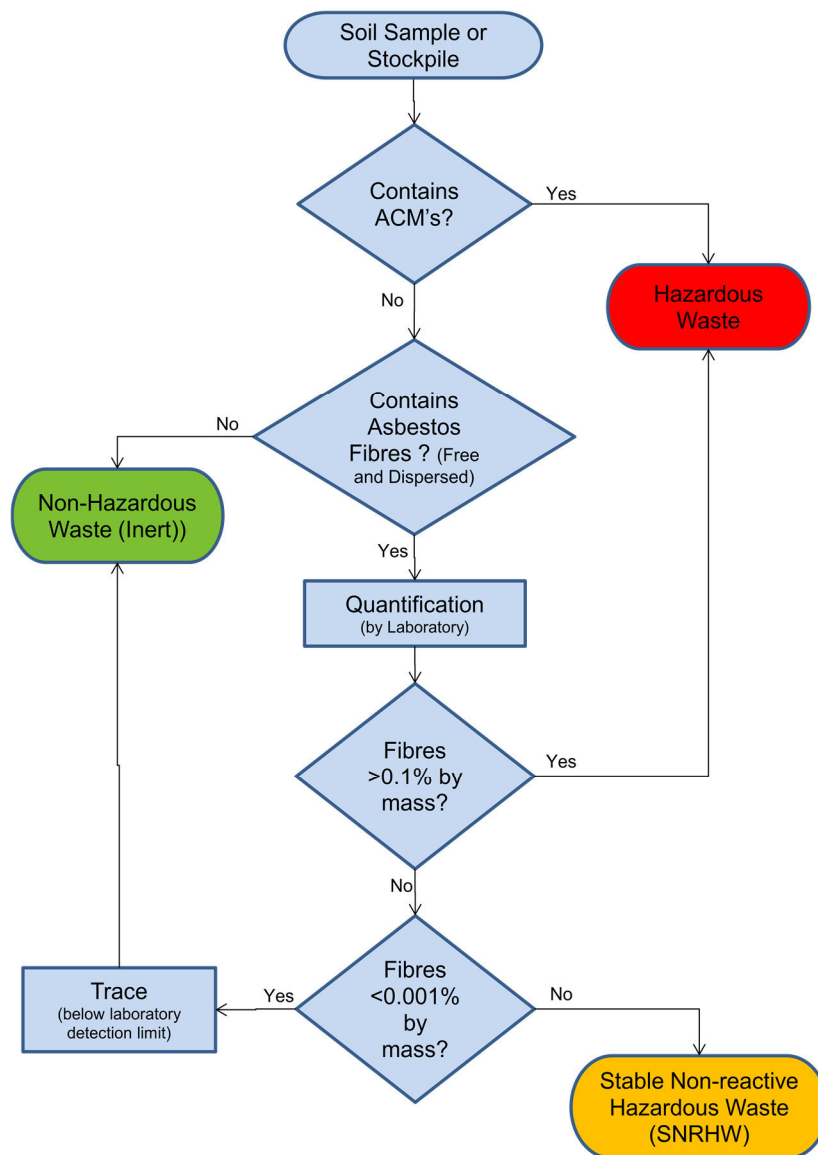
ADDITIONAL ASBESTOS GUIDANCE NOTE

Disposal

The 1st Edition of WM3 “Guidance on the classification and assessment of waste” published in May 2015, 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 site¹. 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/m³.
- 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.

1 – This is based on asbestos concentration only and consideration of other hazardous substances needs to be made and this may affect the classification of the waste.

Asbestos in Soil as Free Fibres

Concentration (by weight)	Waste Disposal				Construction Issues	End Use	
	Recycle	Inert	SNR Hazardous	Hazardous		Suitable for re-use on site	Precautions
Not detected	✓	✓			No precautions necessary, however on a brownfield site asbestos not previously identified may be found during works and a statement within the contractors method statement for how they will deal with this unforeseen asbestos would be good practice to ensure compliance with CAR2012.	Yes	None
Trace (<0.001%)		✓ ²			Precautions are unlikely to be required, however a detailed method statement may be required to ensure compliance with CAR2012. Basic asbestos management good practice will be required. Typically precautions would include: - Ensuring soils do not dry out to become dusty. - Site personnel have the risk communicated at induction stage.	Yes Soils can be re-used under CL:AIRE CoP with the correct precautions in place.	Generally clean cover or hardstanding cover required.
0.001% – 0.099%			✓		Contractor needs to produce an Asbestos Management Plan in accordance with CAR2012 as part of their method statement. Typical precautions would include: - Site personnel have the risk communicated at induction stage. - Ensuring personnel have suitable training. - Task monitoring to inform PPE requirements. - Ensuring soils do not dry out to become dusty and that misting is available during groundworks. - Separate stockpiling. - Clean haulage routes.	Possibly Soils may be able to be re-used under CL:AIRE CoP, subject to a satisfactory Risk Assessment and regulatory agreement with the correct precautions in place.	Clean cover or hardstanding cover required.
0.1+%				✓	Contractor needs to produce an Asbestos Management Plan in accordance with CAR2012 as part of their method statement. Typical precautions would include: - Site personnel have the risk communicated at induction stage. - Ensuring personnel have suitable training. - Task monitoring to inform PPE requirements. - Site wide and or perimeter monitoring. - Ensuring soils do not dry out to become dusty and that misting is available during groundworks. - Separate stockpiling. - Clean haulage routes. - Decontamination unit	Unlikely ³ Re-use of soils containing asbestos within an earthworks scheme will involve significant engineering and the risk for generating dusts will be significantly increased with repeated handling and compaction.	Clean cover and a hard dig layer. A plan should be in place for future excavations as part of the Health and Safety File.

- 2 The standard laboratory detection limit is normally 0.001%. Below 0.001% is trace and currently regarded as not containing asbestos for the purposes of disposal off site. However the waste producer has a duty to fully classify the waste and the presence of trace asbestos should be declared. Consequently it is unlikely that a waste treatment site will take this soil and an inert landfill may make a commercial decision to only take it under some circumstances.
- 3 The re-use of soils containing asbestos at concentrations above hazardous waste 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 warranted where there a long program for implementation.



APPENDIX H Waste Disposal Guidance

WASTE CLASSIFICATION FOR SOILS

Introduction

Waste producers have a duty of care 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 of 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 ie 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, diesel) which have prescribed concentration thresholds, that if breached will render the material hazardous waste. These are based on “risk phrases” which can include risks such as carcinogenicity, flammability or 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**.

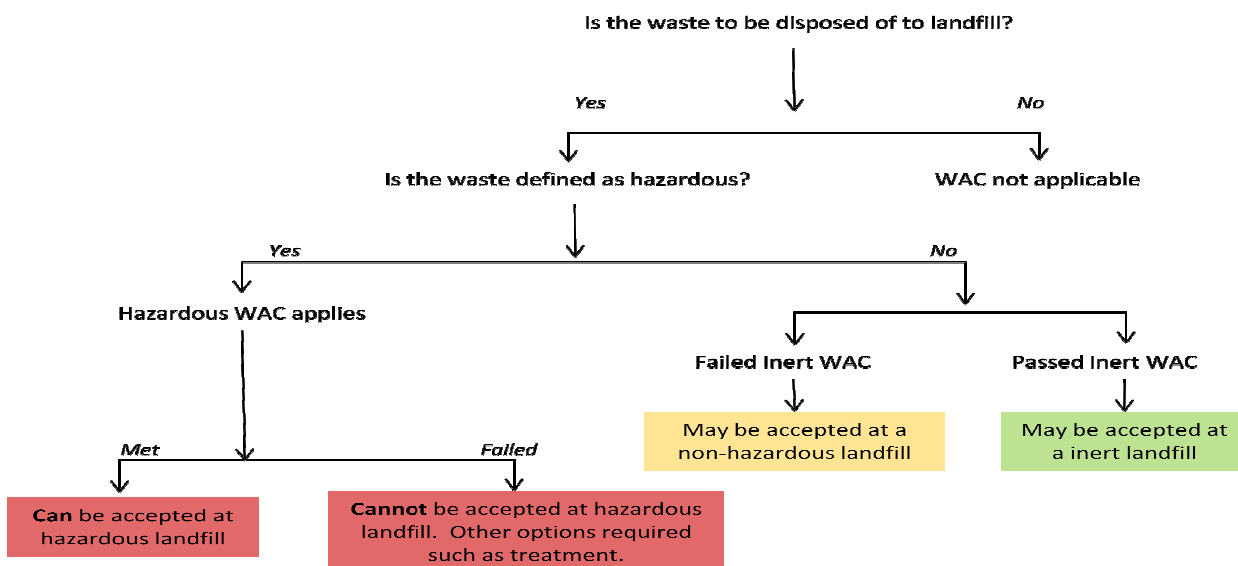
Waste Definitions

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: in the waste alone (for example, by biodegradation); under the impact of long-term ambient conditions (for example, water, air, temperature or mechanical constraints); by the impact of other wastes (including waste products such as leachate and gas).

This option allows hazardous waste that has been stabilised 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. 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.



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 absolute entries are not relevant.

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 that the chromatograph 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 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, 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 Council Decision (2003/33/EC).
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)"* 1st edition May 2015.
5. Classification, Labelling and Packaging of Substances Regulation (EC 1272/2008) (CLP).



**APPENDIX I
CL:AIRE CoP Guidance**

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.

Re-use of Waste

Previously large scale earthworks and remedial schemes relied on waste management exemptions to allow the re-use of waste. However in 2010 the Environment Agency in England and Wales removed many of the waste management licence exemptions and severely restricted the quantity of materials available for other exemptions.

For purposes of earthworks and remediation, the previous exemptions available have been replaced by CL:AIRE Code of Practice (CoP), also commonly referred to as a “Materials Management Plan”.

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. The developer/contractor is advised to complete all works under the CL:AIRE “Development Industry Code of Practice for the Definition of Waste” (CL:AIRE CoP).

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.



APPENDIX J Limitations

Standard Limitations

This ground investigation was conducted and has been prepared for the sole internal use and reliance of the Client, Beech Construction Partnership. 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.

The findings and opinions conveyed via the desk study within this report are based on information obtained from a variety of sources as detailed within this report, which BSL believes are reliable. In addition if information has been used from third parties and in particular other investigations and reports this information has been used in good faith. BSL cannot and does not guarantee the authenticity or reliability of third party information it has relied upon.

The investigation carried out on the site has been conducted to provide the best information and assessment on the ground conditions within site access and budgetary constraints. Exploratory holes only investigate a small area in relation to the overall site area and can therefore only provide a general indication of overall site conditions. Therefore the findings, opinions, geotechnical and environmental recommendations within this report are based on the ground conditions encountered at each location. It should be noted that different ground conditions may exist that have not been identified within this investigation.

The occurrence of and depths to groundwater may vary seasonally due to changes in weather, it should be noted that any observations and recommendations made on groundwater within this report are based on a select number of site visits over a limited period of time and may not be fully representative of groundwater conditions on the site.

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

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

Although every effort has been made to position exploratory holes in the least sensitive areas of the site, exploratory hole positions were located approximately as part of this investigation and no guarantee can be given as to their accuracy. Consideration should be given to the possibility that exploratory holes excavated as part of this investigation and indeed any previous ground investigation work by others may be encountered beneath or within the influence of individual foundations. BSL cannot be held responsible for structural failures caused by the location of foundations of any form of structure within the influence of exploratory holes.

No existing manhole covers were lifted or drainage runs inspected during the course of this ground investigation. The site plans enclosed in this report should not be scaled off.