Ref. No.: **MJH/J1094A/D1/1**

Date: **August 2012**

PHASE II GEOTECHNICAL & GEO-ENVIRONMENTAL INVESTIGATION
For
HEINEKEN UK LIMITED
On the Site of a
PROPOSED FERMENTATION BUILDING, ROYAL BREWERY, MANCHESTER

CONTENTS

1.0 INTRODUCTION ……....1

2.0 THE SITE & BACKGROUND…….……..…….....2
2.1 Site Location & Access
2.2 Site Description & Surroundings
2.3 History of the Site
2.4 Geology
2.5 Landmark Envirocheck Report
2.6 Radon

3.0 SCOPE OF THE INVESTIGATION…….……..……...…4
3.1 Introduction
3.2 Dynamic Sampler Boreholes
3.3 Cable Percussion Borehole
3.4 Laboratory Testing & Analyses

4.0 FINDINGS OF THE INVESTIGATION…..…….....…….…6
4.1 Ground Conditions Encountered
4.2 Geotechnical Laboratory Testing
4.3 Chemical laboratory Analyses

5.0 GEOTECHNICAL ASSESSMENT……..……9
5.1 Summary of Ground Conditions & Proposed Development
5.2 Foundations
5.3 Concrete Design

6.0 GEO-ENVIRONMENTAL ASSESSMENT……11
6.1 Contamination
6.2 Radon & Other Ground Gases

DRAWINGS

J1094A/01 Site Location Plan
J1094A/02 Site Plan
J1094A/03 Approximate Locations of Investigatory Holes

APPENDICES

Appendix A Logs of Investigatory Holes
Appendix B Laboratory Test Results

1.0 INTRODUCTION

1.1 This report describes a Phase II geotechnical and geo-environmental investigation on the site of a proposed fermentation building, Royal Brewery, Denmark Road, Manchester, (see drawings J1094A/01 and J1094A/02), carried out for our Client, Heineken UK.

1.2 The objectives of this investigation have been to obtain information relating to the geotechnical and geo-environmental conditions pertaining to the site and its surroundings and to produce an assessment of these factors in relation to the proposed redevelopment.

1.3 This report has been produced on behalf of the Client, Heineken UK, and no responsibility is accepted to any third party for all or any part. This report should not be relied upon or transferred to any other parties without the express written authorisation of Emcus Limited. If any unauthorised third party comes into possession of this report, they rely on it at their own risk and the authors owe them no duty of care or skill.

1.4 The site plans and drawings enclosed in this report should not be scaled off.

2.0 THE SITE AND BACKGROUND

2.1 Site Location & Access

2.1.1 The site is located in the south-western area of the Royal Brewery, Denmark Road, Manchester, (see Drawings J1094A/01 and J1094A/02). The Ordnance Survey grid reference for the approximate centre of the site is SJ 8395 9585.

2.1.2 For the purpose of the recent investigation site works (19th July 2012), access to the Royal Brewery was gained from Denmark Road. Once within the curtlidge of the brewery, access to the site was gained via the private brewery roads.

2.2 Site Description & Surroundings

2.2.1 At the time of the investigation site works, the site generally comprised part of an approximately flat lying car park and access road. The car park was generally surfaced with macadam, but with a concrete 'strip' along the south-western margin of the site.

2.2.2 In addition, an approximately north-west / south-east orientated raised border was present in the south-eastern area of the site, planted with bushes and mature trees. A small rectangular structure / building was present in the central area of the site, at the north-western area of the planted border. The structural Engineers for the project (Norder Design Associates) have advised that small building is associated with a below ground oil storage tank which is present beneath the central area of the site. (The corners of the tank are defined by 4 metal covers at ground level). Norder have further advised that the tank is no longer used and has been decommissioned.

2.2.3 The north-western and south-western and eastern boundaries of the site were defined by soft landscaping strips, planted with shrubs and mature trees. The northern and south—eastern boundaries of the site were undefined on the ground at the time of the investigation site works.

2.2.4 The areas to the north, north-west and east of the site comprised other buildings, structures and infrastructure, associated with the Royal Brewery. The south-western boundary of the Royal Brewery was present approximately 5m to the south-west of the site, with residential housing and associated infrastructure generally present beyond.

2.3 History of the Site

2.3.1 We have undertaken a review of historical maps for the area of the site held within our library. The historical maps include extracts of 1:1,250, 1:2,500, 1;10,000 and 1:10,560 scale County Series and Ordnance Survey (OS) maps dated between 1848 and 2011.

2.3.2 The historical maps dated 1848 – 1951 indicate that the southern area of the site comprised a row of terraced houses and associated gardens. The north-western area of the site comprised part of a north-east / south west orientated road (Derby Street).

2.3.3 The historical map dated 1976 indicates that the site was then 'undeveloped'. The north-eastern area of the site is indicated to have formed part of the Royal Brewery, which was centred to the north of the site. The south-western area of the site is indicated to have formed part of a hardstanding area, immediately beyond the north-eastern edge of a road (Moss Lane East).

2.3.4 The historical maps dated 1977 – 2011 indicate that the site generally comprised an area of hardstanding in the south-western area of the Royal Brewery. The historical maps dated 1984/89 indicate that an approximately north-west / south-eastern landscaping strip in the south-eastern area of site.

2.4 Geology

2.4.1 The following publications of the British Geological Survey (BGS) have been examined in respect of the strata underlying the site:

- BGS Map, Sheet 85 Manchester, Solid & Drift Edition, Scale 1:63,360, dated 1970.
- 'Geology of Britain Viewer', available on the BGS website.

2.4.2 The published geological information indicates that the natural geology underlying the site comprises Glacial Boulder Clay, (nowadays more commonly referred to a Glacial Till), underlain by the 'Sherwood Sandstone Group' from the Permo-Triassic.

2.4.3 Boulder Clay / Glacial Till typically comprises stiff sandy clay incorporating gravel and small cobbles. The Sherwood Sandstone Group typically comprises weakly cemented sandstone, with occasional gravelly beds.

2.5 Landmark Envirocheck Report

2.5.1 We have undertaken a review of the Landmark Envirocheck database report obtained in July 2011 for the geo-environmental investigation of the former 'Howels Building', located approximately 80m to the north-east of the site. The Envirocheck report identifies a single 'Historical Landfill Site', approximately 240m to the north-west of the site. The landfill is reported to have been licensed to Demolition Service Limited to accept inert and industrial Waste between May 1994 and June 1995. The Envirocheck report does not identify any other landfills and / or waste management facilities within 250m of the site.

2.6 Radon

2.6.1 The Building Research Establishment (BRE) document entitled BR 211 'Radon Guidance on protective measures for new buildings', 2007, has been reviewed to determine whether Radon protection measures should be included in the proposed development. Annex A of BR 211 indicates that the site is located in an area where Radon protection measures are not required.

3.0 SCOPE OF THE INVESTIGATION

3.1 Introduction

3.1.1 Intrusive geotechnical investigation of the site was undertaken on the 19th July 2012, under the supervision of a suitably experienced geotechnical Engineer from Emcus Limited. In summary, the investigation site works comprised the following:

- The advancement of 4 dynamic sampler boreholes (WS101 – WS104) to depths of 3.8m – 5.3m bgl.
- The advancement of a single cable percussion borehole (BH1) to a maximum depth of 10.6m bgl.

3.1.2 The approximate locations of the investigatory holes are indicated on drawing J1094A/03. The investigatory holes were located to avoid the locations of known / suspected buried services. Furthermore, prior to advancing the boreholes, hand dug starter pits were excavated to 1.2m bgl to clear any unrecorded shallow underground services.

3.1.3 The investigatory holes were logged by an experienced geotechnical Engineer in general accordance with BS 5930: 'Code of Practice for Site Investigations', 1999. Engineers logs of the investigatory holes presented in Appendix A of this report.

3.1.4 The investigation can be described in more detail as follows.

3.2 Dynamic Sampler Boreholes

3.2.1 The 4 dynamic sampler boreholes were advanced using a 'Premier 100' tracked rig. Standard Penetration Tests (SPT) were undertaken in all of the dynamic sampler boreholes at approximately 1m vertical centres.

3.2.2 Representative disturbed samples were recovered from all the strata encountered in the dynamic sampler boreholes and placed into plastic containers and glass jars provided by the analytical laboratory for that purpose.

3.2.3 On completion, the dynamic sampler boreholes were backfilled with arisings and the surface reinstated with cold lay macadam.

3.3 Cable Percussion Borehole

3.3.1 The cable percussion borehole was advanced at a nominal 150mm diameter, using a 'Dando 150' drilling rig. Representative disturbed samples were recovered from all the strata encountered in the cable percussion borehole and placed into plastic containers and glass jars provided by the analytical laboratory for that purpose.

3.3.2 Standard Penetration Tests (SPT's) were undertaken in the cable percussion borehole at 1m vertical centres from ground level to 5.5m bgl and 1.5m vertical centres thereafter.

3.3.3 On completion, the cable percussion borehole was backfilled with arisings and the surface reinstated with a skim of cement mortar.

3.4 Laboratory Testing & Analyses

3.4.1 Selected disturbed samples recovered from the boreholes were subsequently submitted to MCERTS and UKAS accredited laboratories for chemical analysis and geotechnical testing.

3.4.2 4 samples of Made Ground were analysed at the laboratories of Chemtest for a typical suite of potential contaminants, including a range of metals & semi-metals, phenol, cyanides, total sulphate, sulphur, sulphides & pH, together with the USEPA 16 speciated PolyAromatic Hydrocarbons. [PAH's]. 3 samples (2 Made Ground & 1 natural strata) were analysed for Total Petroleum Hydrocarbons, speciated in accordance with current UK guidelines (TPH-CWG). 3 samples of the Made Ground were also analysed for presence of asbestos.

3.4.3 2 samples of Made Ground were also analysed for Waste Acceptance Criteria (WAC) screening suites.

3.4.4 3 representative samples of the natural strata were submitted for geotechnical testing at the laboratories of Geonetix Ltd. in accordance with BS 1377: Methods of Test of Soils for Civil Engineering Purposes: 1990. The testing carried out on these samples comprised 1 moisture content and plasticity index analyses and 2 grading analyses.

3.4.5 3 samples of the strata encountered were also tested at the Chemtest laboratories for pH and water soluble sulphates to determine the potential aggressiveness of the ground to buried concrete.

3.4.6 Further details and results of the chemical analyses and the geotechnical laboratory testing are presented in Appendix B of this report.

4.0 FINDINGS OF THE INVESTIGATION

4.1 Ground Conditions Encountered

4.1.1 Made Ground was encountered in all of the boreholes to maximum depths of 1.3m bgl (WS104) to 5.1m bgl (WS102). The Made Ground initially comprised black macadam to 0.1m bgl., underlain by grey-brown sandy sub-angular gravel (sub-base) to 0.18m – 0.22m bgl. Underlying the sub-base, the Made Ground generally comprised orange and brown sandy gravel fill, incorporating in varying proportions, fragments of brick, concrete, plastic, glass and ash. Furthermore, in WS102, grey silt based fill incorporating occasional fragments of brick and rare timber was encountered from 3.7m bgl to 5.1m bgl.

4.1.2 Natural strata was encountered in all of the boreholes, underlying the Made Ground. In all of the dynamic sampler boreholes, (WS101 – WS104), stiff grey-brown clay incorporating occasional sub-angular gravel of coal, mudstone, and sandstone was generally encountered. The generally stiff clay extended beyond the bottom of the dynamic sampler boreholes. The natural strata encountered in the cable percussion borehole (BH1) initially comprised soft brown sandy clay to 2.25m bgl and then firm to stiff grey-brown clay with fragments of coal, mudstone and sandstone to 5.5m bgl. Underlying the clay, medium dense brown sand and sub-rounded to sub-angular gravel was encountered to 7m bgl. Underlying the brown sand and gravel, very dense red-brown silty medium grained sand was encountered. The red-brown silty sand extended beyond the bottom of the cable percussion borehole. The very dense sand caused effective refusal of the cable percussion borehole at 10.6m bgl.

4.1.3 The Standard Penetration Tests (SPT's) undertaken completely within the Made Ground revealed 'N' values of between 2 and 9. The SPT's in the grey-brown clay with fragments of coal, mudstone and sandstone revealed 'N' values of 9 – 26, confirming the clays to be generally firm to stiff. The 3 SPT's undertaken within the dense red-brown sands encountered in BH1 below 7m bgl., revealed 'N' values of more than 50, (i.e. refusal of the test).

4.1.4 During the advancement of borehole WS102, a hydrocarbon odour was encountered at 3.8m bgl. No other visual and / or olfactory evidence of contamination was encountered during the advancement of the other boreholes.

4.1.5 Groundwater was encountered in WS101, WS102 and WS103 and 2.3 – 3.5m bgl., during the investigation site works. In BH1, groundwater was encountered at 6.5m bgl and rose to 4m bgl during drilling. No groundwater was encountered during the advancement of WS104.

4.2 Geotechnical Laboratory Testing

4.2.1 The results of the single moisture content and plasticity index analyses can be summarised in the following table.

Sample Reference	Moisture Content	% Smaller than 425µm	Plastic Limit	Plasticity Index
WS104 @ 2.5 – 3m bgl	18%	96%	19%	23

4.2.2 The grading analyses revealed the representative sample from BH1 at 6.6m – 7m bgl comprised sandy gravel with 10.8% silt and clay sized particles. The grading analyses revealed the representative sample from BH1 at 9m – 10m bgl comprised slightly gravelly sand with 5.9% silt and clay sized particles.

4.2.3 The results of the laboratory testing indicate that the pH of the strata at the site was within the range 7.5 to 8.9. Associated water soluble sulphate concentrations of 0.01g/l as SO_4 were revealed for the samples of strata tested.

4.3 Chemical Laboratory Analyses

4.3.1 The results of the chemical contamination testing have been assessed, so far as possible with reference to the recently published Soil Guideline Values (SGV's). Thus far, however, SGV's have only been published for eleven determinands. In the absence of published SGV's for many contaminants, the results of the chemical contamination analyses have been assessed with reference to Generic Assessment Criteria (GAC's), generally calculated using the new version (1.06) of the CLEA software, its handbook, and pending publication of new toxicological reports, the 'old approach' toxicological reports. In the absence of published guidance for assessing certain potential contaminants, the assessment of the determined concentrations of these substances has been based on a combination of previous experience or other available assessment guidelines.

4.3.2 Further guidance on the new CLEA model is presented in: 'Human health toxicological assessment of contaminants in soil', Science Report SC050021/SR2, dated August 2008 (the TOX Guidance Report); and 'Updated technical background to the CLEA model', Science Report SC050021/SR3, also dated August 2008.

4.4.3 The calculated SGV's, GAC's, etc. are interpreted in current guidance as 'intervention values' relative to a particular intended end use for the respective site, to provide a means of assessing possible long term chronic risks to human health. They are based on assumptions about soil conditions and the existence of exposure pathway behaviour for the particular contaminant. The exceedance of an SGV, GAC, etc. can thus be taken as indicating that further detailed assessment and/or remedial action is required to enable/facilitate development for the particular end use of the site concerned.

4.4.4 We have been advised that the site is to be developed with a fermentation building, within The Royal Brewery. As such, the results of the contamination analyses have been assessed for a 'Commercial' / 'Industrial' land use category within the CLEA model.

4.4.5 The results of the chemical analyses have revealed the site to be generally free of significant contamination, with the majority of the determinands tested for, revealing

concentrations, falling either below the levels of detection or not exceeding their respective assessment criteria (published SGV's / GAC's) for the proposed end use.

4.4.6 The only exception to these general findings was a slightly elevated concentration of lead revealed in the sample of Made Ground analysed at 0.5m bgl in WS103.

4.4.7 The results of the Waste Acceptance Criteria (WAC) analyses indicate that the strata beneath the site are within the 'Inert' waste category.

5.0 GEOTECHNICAL ASSESSMENT

5.1 Summary of Ground Conditions & Proposed Development

5.1.1 It is considered that the ground conditions encountered by the investigatory holes generally confirm the published geological information and reflect the past usage of the site indicated by the historical maps.

5.1.2 Made Ground was encountered in all of the boreholes to maximum depths of 1.3m bgl (WS104) to 5.1m bgl (WS102). The Made Ground generally comprised a surface veneer of macadam to 0.1m bgl., underlain by orange, grey and brown sandy gravel fill, incorporating in varying proportions, fragments of brick, concrete, plastic, glass and ash. Furthermore, in WS102, grey silt based fill incorporating occasional fragments of brick and rare timber was encountered from 3.7m bgl to 5.1m bgl. It is considered that the Made Ground is generally associated with the residential houses which were historically present on the site and the more recent brewery hardstanding. In addition, the deeper Made Ground encountered in WS102 is likely to represent backfill adjacent to the underground tank which is present beneath the central area of the site.

5.1.3 Natural strata was encountered in all of the boreholes, underlying the Made Ground. In all of the dynamic sampler boreholes, (WS101 – WS104), stiff grey-brown clay incorporating occasional sub-angular gravel of coal, mudstone, and sandstone was generally encountered. The generally stiff clay extended beyond the bottom of the dynamic sampler boreholes. The natural strata encountered in the cable percussion borehole (BH1) initially comprised soft brown sandy clay to 2.25m bgl and then firm to stiff grey-brown clay with fragments of coal, mudstone and sandstone to 5.5m bgl. Underlying the clay, medium dense brown sand and sub-rounded to sub-angular gravel was encountered to 7m bgl. The firm to stiff gravelly clays and medium dense sands & gravels are considered to represent Glacial Till. Underlying the Glacial Till, very dense red-brown silty medium grained sand was encountered. The very dense sand caused effective refusal of the cable percussion borehole at 10.6m bgl.

5.1.4 The Structural Engineers for the project have advised that the site is to be re-developed with a fermentation building, including several large vessels / tanks. Furthermore, we have assumed that the decommissioned underground storage tank will be excavated during the re-development of the site.

5.2 Foundations

5.2.1 It is anticipated that the Made Ground encountered beneath the site will not provide a suitable bearing strata for the proposed fermentation building and / or vessels, due to its variability and likely settlement characteristics.

5.2.2 In view of the deep Made Ground beneath the central area of the site, (5.1m bgl in WS102), it is anticipated that piles will prove the most appropriate foundation solution for the proposed fermentation building and the associated vessels, etc. It is anticipated that driven or augered piles will prove appropriate for the proposed development, end bearing on the very dense sands encountered beneath the site.

5.3 Concrete Design

5.3.1 We have considered the sites geology and the ground conditions in accordance with the guidelines contained in Part C of BRE Special Digest 1 : Concrete in aggressive ground (2005) and have categorised the site as a 'greenfiled' site.

5.3.2 The results of the water soluble sulphate analyses undertaken at the site fall within Design Sulphate (DS) Class DS-1. The groundwater conditions at the site should be considered to be mobile (potentially). On this basis and from consideration of the pH conditions at the site, the site has been assigned an ACEC (Aggressive Chemical Environment for Concrete) Class *AC1*.

5.3.3 The specific concrete mixes (The Design Chemical Class) to be used on site for all the 'in the ground' and 'on the ground' permanent applications should be determined, mindful of the ACEC Class, by the site specific concrete requirements, in terms of the required durability and structural performance. These are assessed in terms of the Intended Working Life and any need for Additional Protective Measures (APM), as detailed in Part D, with further guidance in Parts E and F, of the BRE Special Digest 1, (2005).

6.0 GEO-ENVIRONMENTAL ASSESSMENT

6.1 Contamination

6.1.1 The results of the chemical analyses have revealed that the strata beneath the site is generally free of significant contamination, with the majority of determinands tested for revealing concentrations falling either below the levels of detection for the laboratory method used, or below their respective assessment criteria (published SGV's, GAC's, etc.) for a commercial / industrial end use. However, the sample of Made Ground from WS103 revealed a slightly elevated concentration of lead.

6.1.2 The site is to be redeveloped with a fermentation building, including several vessels / tanks. We understand that the fermentation building will generally be surrounded by concrete / tarmac hardstanding and that no soft landscaping areas are proposed at the site. It is considered that the concrete floor slab of the proposed fermentation building and the surrounding hardstanding will prevent the slightly elevated concentrations of lead posing a significant risk to end users of the site.

6.1.3 If during the proposed development of the site, any visual or olfactory evidence of contamination is encountered, then further advice from a suitably qualified and experienced Geo-Environmental Engineer should be sought.

6.2 Radon & Other Ground Gas

6.2.1 The Building Research Establishment (BRE) document entitled BR211 'Radon Guidance on protective measures for new buildings', 2007, indicates that No Specific Radon Protective Measures are required at the site.

6.2.3 The reviewed Envirocheck Report identifies a single 'Historical Landfill Site', approximately 240m to the north-west of the site. The landfill is reported to have been licensed to Demolition Service Limited to accept inert and industrial Waste between May 1994 and June 1995. Given the reported location of the landfill away from the site, allied with the generally cohesive strata at shallow depth beneath the site, it is considered unlikely that the 'Historical Landfill' poses a significant risk to users of the proposed large, well ventilated brewery building.

6.2.4 In view of the above, it is considered that no special gas protection measures are required to be incorporated in the proposed building at the site.

6.3 We recommend that the above geo-environmental assessment is discussed and agreed with the Local Authority, prior to any irrevocable actions being taken.

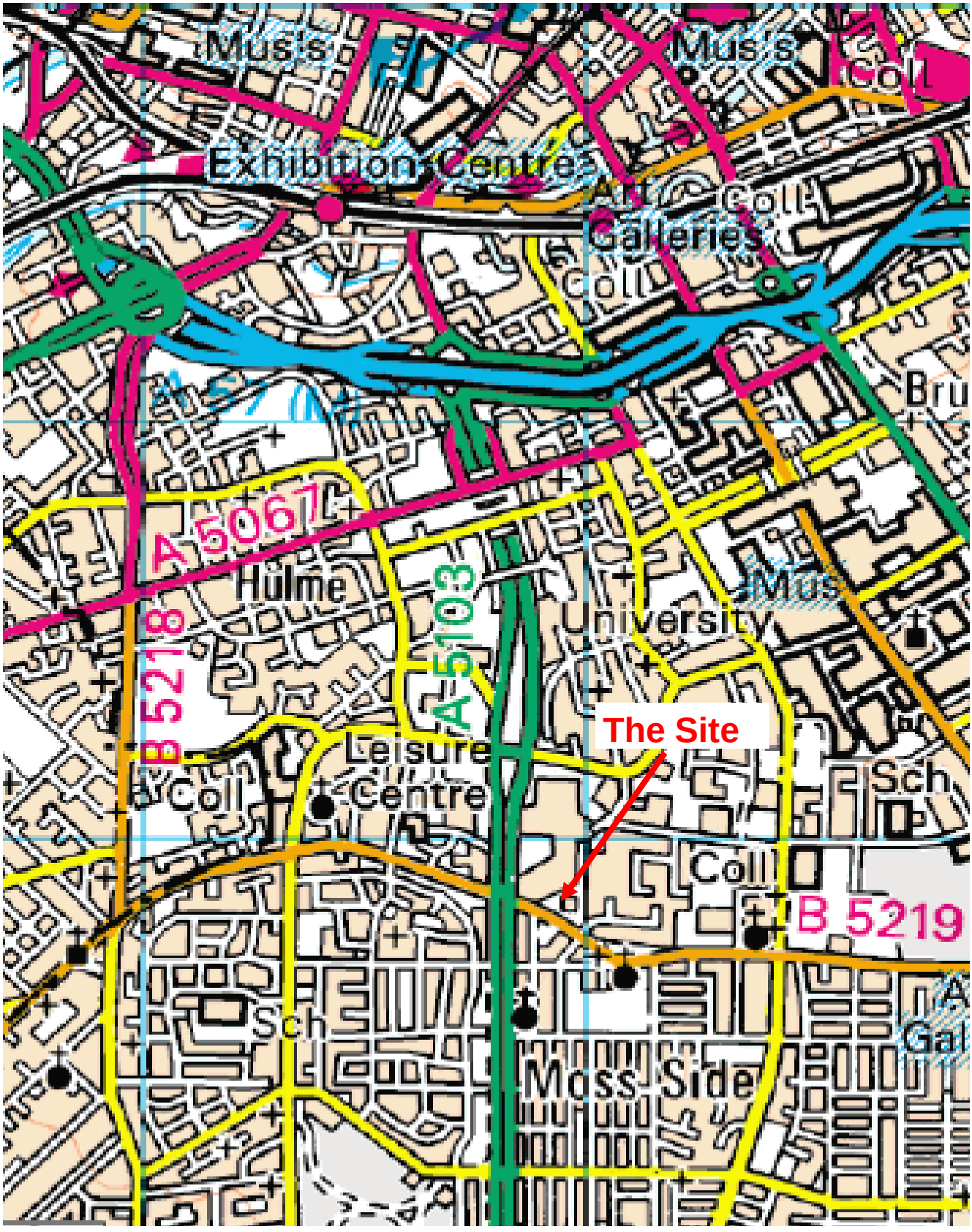
We trust the above report is suitable for your present requirements. Should you have any comments or queries, wish to discuss any of the above matters, or require any further assistance, please do not hesitate to contact us.

For & on behalf of EMCUS Ltd.



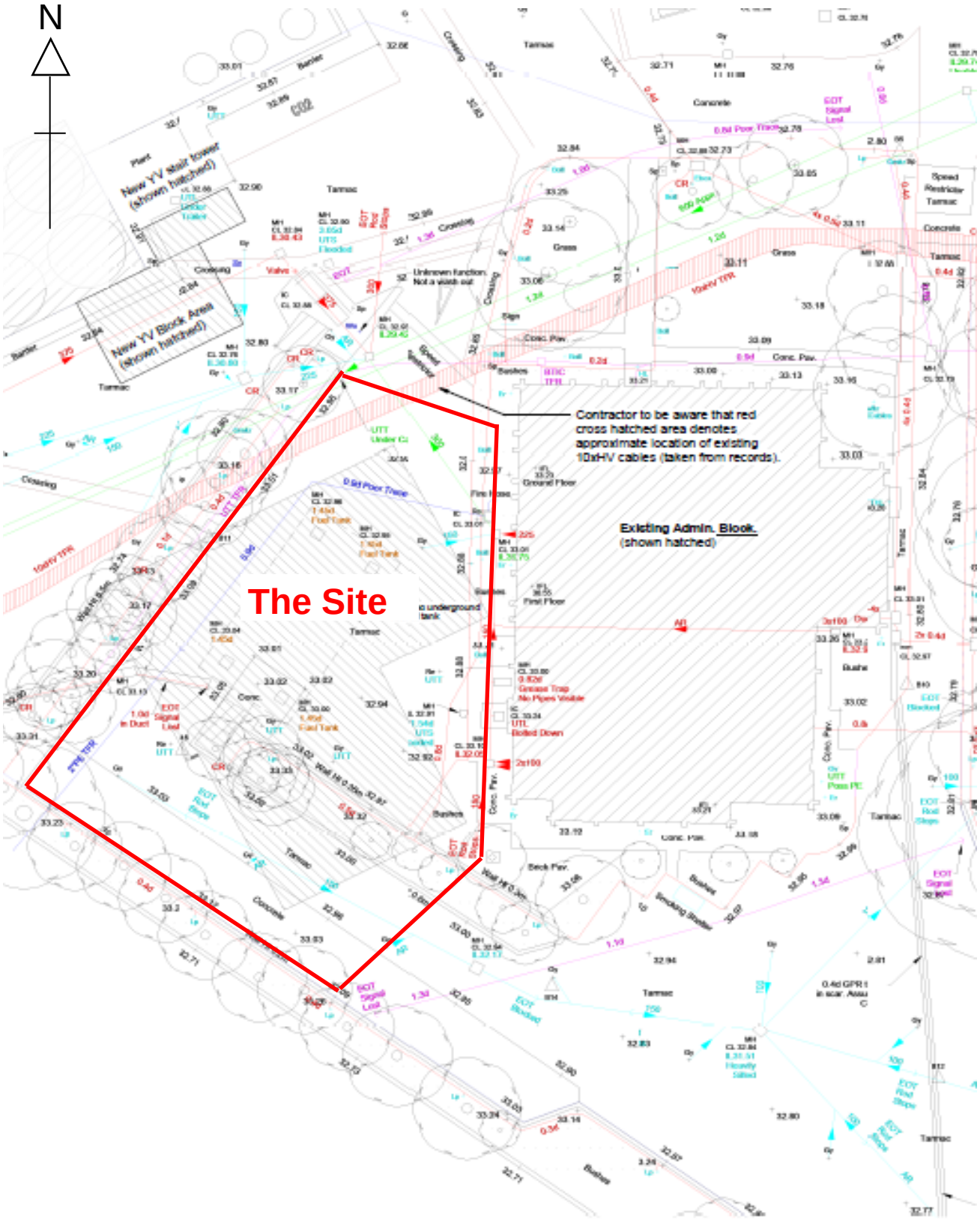
M. J. Hanford, BSc (Hon's) P.Dip FGS
Technical Director

DRAWINGS



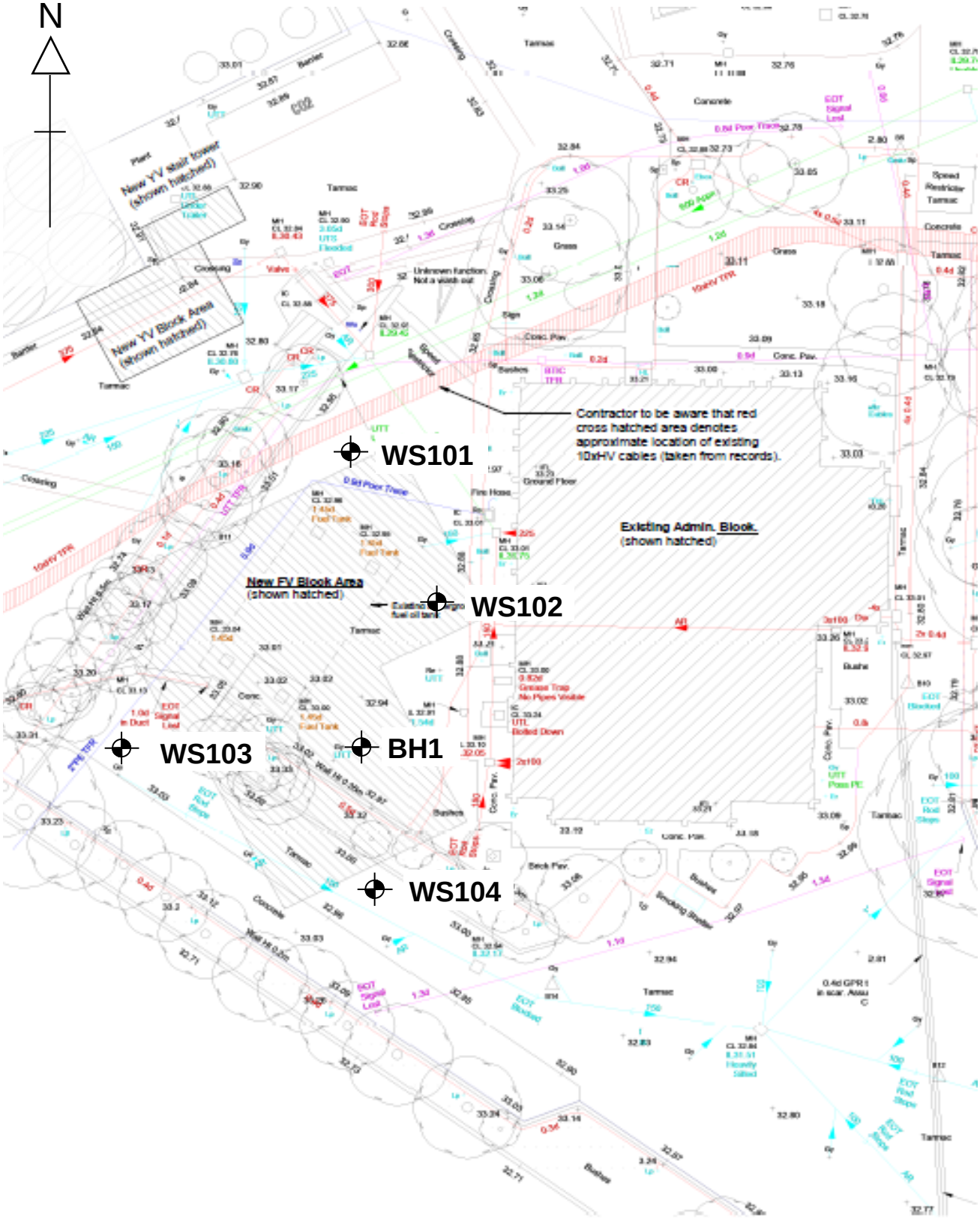
Drawing Title: **Site Location Plan**		**J1094A/01**	
		Scale at A4: NTS	
Project: **Fermentation Building, Royal Brewery, Manchester**		Drawn: MJH	Approved: MJH
Client: **Heineken UK**		Date: 16/08/2012	Date: 16/08/2012

emcus
geotechnical & geo-environmental



Drawing Title: **Site Plan**		**J1094A/02**	
		Scale at A4: NTS	
Project: **Fermentation Building, Royal Brewery, Manchester**		Drawn: MJH	Approved: MJH
Client: **Heineken UK**		Date: 16/08/2012	Date: 16/08/2012

emcus
geotechnical & geo-environmental



Drawing Title	**Approximate Borehole Locations (Shown in relation to proposed building)**	**J1094A/03**	
		Scale at A4: NTS	
Project	**Fermentation Building, Royal Brewery, Manchester**	Drawn: MJH	Approved: MJH
Client	**Heineken UK**	Date: 16/08/2012	Date: 16/08/2012

emcus
geotechnical & geo-environmental

APPENDICES

Appendix A

Logs of Investigatory Holes

Client: Heineken UK Limited

Site: Fermentation Building, Royal Brewery

Project No. : J1094A

Record of Borehole WS101

Start date	20/07/2012
End date	20/07/2012
Final Depth	4.50m bgl
Page	1 of 1

Penetration Testing							Samples		Strata					
Type	Depth	0 - 150mm	150 - 225mm	225 - 300mm	300 - 375mm	375 - 450mm	U100 Recovery	Disturbed	Legend	Depth (Thickness)	Level	N Value	Strata Descriptions	Installation Details
										(0.10) 0.10			MADE GROUND: Black macadam	
								T		(0.10) 0.20			MADE GROUND: Grey brown sandy gravel fill (sub-base)	
c	1.20	2 /150	1 /75	1 /75	1 /75	1 /75				(1.00) 1.20		4	MADE GROUND: Brown sandy gravel fill incorporating many fragments of brick and sandstone	
								T					MADE GROUND: Brown sandy sub-angular gravel fill with occasional small fragments of brick.	
c	2.00	1 /150	1 /75	/75	1 /75	/75				(1.60)		2		
								T		2.80			Stiff grey brown CLAY with occasional sub-angular gravel of coal, mudstone and sandstone	
								T		(1.70)				
c	4.00	4 /150	3 /75	4 /75	4 /75	4 /75				4.50		15		

General remarks

1) Groundwater encountered at 2.8m bgl.
2) No recovery from 4m - 4.5m bgl.
3) Borehole backfilled with arisngs and surface reinstated with cold lay tarmac.

Equipment: Dynamic Sampler

Repeated collapse of borehole sides below 2.8m bgl.

Logging Engineer: MJH

Approved

Key
T = Plastic Tub & Glass Jar
J = Glass Vial
B= Small Disturbed Sample
W = Water Sample
S = Standard Penetration Test (SPT)
C = Cone Penetration Test (CPT)
R = SPT / CPT Refusal
LB = Large Bulk
U = U100 Undisturbed Sample

Client: Heineken UK Limited

Site: Fermentation Building, Royal Brewery

Project No. : J1094A

Record of Borehole WS102

Start date	20/07/2012
End date	20/07/2012
Final Depth	5.30m bgl
Page	1 of 1

Penetration Testing							Samples		Strata					
Type	Depth	0 - 150mm	150 - 225mm	225 - 300mm	300 - 375mm	375 - 450mm	U100 Recovery	Disturbed	Legend	Depth (Thickness)	Level	N Value	Strata Descriptions	Installation Details
										(0.15) 0.15			MADE GROUND: Black macadam	
										(0.05) 0.20			MADE GROUND: Grey brown sandy gravel fill (sub-base)	
								T		(0.80) 1.00			MADE GROUND: Brown sandy gravel fill incorporating many fragments of brick and sandstone	
c	1.20	4 /150	2 /75	2 /75	2 /75	2 /75		T				8	MADE GROUND: Orange and brown sandy sub-angular gravel fill with occasional small fragments of brick and rare cobbles of sandstone	
c	2.00	2 /150	2 /75	1 /75	1 /75	1 /75		T		(2.70)		5		
c	3.00	1 /150	1 /75	1 /75	2 /75	2 /75		T		3.70		6	MADE GROUND: Grey silty clay fill incorporating occasional brick and rare pieces of timber.	
								T		(1.40) 5.10			Stiff grey sandy CLAY	
								T		(0.20) 5.30				

General remarks

1) Groundwater encountered at 2.3m bgl.
2) Hydrocarbon odour at 3.8m bgl.
3) Borehole backfilled with arisngs and surface reinstated with cold lay tarmac.

Equipment: Dynamic Sampler

Repeated collapse of borehole sides below 3.5m bgl.

Logging Engineer: MJH

Approved

Key
T = Plastic Tub & Glass Jar
J = Glass Vial
B= Small Disturbed Sample
W = Water Sample
S = Standard Penetration Test (SPT)
C = Cone Penetration Test (CPT)
R = SPT / CPT Refusal
LB = Large Bulk
U = U100 Undisturbed Sample

Client: Heineken UK Limited

Site: Fermentation Building, Royal Brewery

Project No. : J1094A

Record of Borehole WS103

Start date	20/07/2012
End date	20/07/2012
Final Depth	3.80m bgl
Page	1 of 1

Penetration Testing							Samples		Strata					
Type	Depth	0 - 150mm	150 - 225mm	225 - 300mm	300 - 375mm	375 - 450mm	U100 Recovery	Disturbed	Legend	Depth (Thickness)	Level	N Value	Strata Descriptions	Installation Details
								T		(0.10) 0.10			MADE GROUND: Black macadam	
										(0.12) 0.22			MADE GROUND: Grey brown sandy gravel fill (sub-base)	
c	1.20	3 /150	1 /75	1 /75	2 /75	1 /75				(1.58) 1.80		5	MADE GROUND: Brown and orange-brown sandy gravel fill incorporating much brick and occasional glass and plastic.	
c	2.00	1 /150	1 /75	2 /75	3 /75	3 /75				(0.70) 2.50		9	MADE GROUND: Brown clay, locally sand based fill incorporating occasional fragments of brick and wood / roots.	
c	3.00	7 /150	4 /75	5 /75	6 /75	7 /75		T		(1.30) 3.80		22	Stiff grey brown CLAY with occasional sub-angular gravel of coal, mudstone and sandstone. Becoming very stiff with increasing depth below ground level.	

General remarks

1) Groundwater encountered at 3.5m bgl.
2) Refusal of sampler at 3.8m bgl.
3) Borehole backfilled with arisngs and surface reinstated with cold lay tarmac.

Equipment Dynamic Sampler

Logging Engineer MJH

Approved

Key
T = Plastic Tub & Glass Jar
J = Glass Vial
B= Small Disturbed Sample
W = Water Sample
S = Standard Penetration Test (SPT)
C = Cone Penetration Test (CPT)
R = SPT / CPT Refusal
LB = Large Bulk
U = U100 Undisturbed Sample

Client: Heineken UK Limited

Site: Fermentation Building, Royal Brewery

Project No. : J1094A

Record of Borehole WS104

Start date	20/07/2012
End date	20/07/2012
Final Depth	4.00m bgl
Page	1 of 1

Penetration Testing							Samples		Strata					
Type	Depth	0 - 150mm	150 - 225mm	225 - 300mm	300 - 375mm	375 - 450mm	U100 Recovery	Disturbed	Legend	Depth (Thickness)	Level	N Value	Strata Descriptions	Installation Details
										(0.10) 0.10			MADE GROUND: Black macadam	
										(0.08) 0.18			MADE GROUND: Grey brown sandy gravel fill (sub-base)	
								T		(1.12)			MADE GROUND: Brown and orange sandy gravel based, locally clay based fill incorporating much brick and occasional concrete.	
c	1.20	1 /150	1 /75	1 /75	2 /75	3 /75		T		1.30		7		
c	2.00	2 /150	2 /75	3 /75	4 /75	5 /75						14	Stiff grey brown CLAY with occasional sub-angular gravel of coal, mudstone and sandstone. Becoming very stiff with increasing depth below ground level. (Horizon of clayey sand from 1.4m - 1.8m bgl)	
								B		(2.70)				
c	3.00	9 /150	6 /75	6 /75	7 /75	7 /75						26		
										4.00				

General remarks

1) No groundwater encountered.
2) Refusal of sampler at 4m bgl.
3) Borehole backfilled with arisngs and surface reinstated with cold lay tarmac.

Equipment Dynamic Sampler

Logging Engineer MJH

Approved

Key
T = Plastic Tub & Glass Jar
J = Glass Vial
B= Small Disturbed Sample
W = Water Sample

S = Standard Penetration Test (SPT)
C = Cone Penetration Test (CPT)
R = SPT / CPT Refusal
LB = Large Bulk
U = U100 Undisturbed Sample

Client: Heineken UK Limited

Site: Fermentation Building, Royal Brewery

Project No. : J1094A

Record of Borehole BH1

Start date	20/07/2012
End date	20/07/2012
Final Depth	10.60m bgl
Page	1 of 1

Penetration Testing							Samples		Strata					
Type	Depth	0 - 150mm	150 - 225mm	225 - 300mm	300 - 375mm	375 - 450mm	U100 Recovery	Disturbed	Legend	Depth (Thickness)	Level	N Value	Strata Descriptions	Installation Details
								T+B		(0.10)			MADE GROUND: Black macadam	
								T		0.10			MADE GROUND: Grey brown sandy gravel fill (sub-base)	
										(0.15)				
										0.25			MADE GROUND: Brown sandy gravel fill incorporating many fragments of brick and sandstone and rare fragments of ash	
										(1.25)				
s	1.50	3 /150	1 /75	2 /75	1 /75	2 /75				1.50		6		
										(0.75)			Soft brown sandy CLAY	
								T+B		2.25				
s	2.50	3 /150	3 /75	3 /75	4 /75	6 /75						16	Firm to stiff grey brown CLAY with occasional sub-angular gravel of coal, mudstone and sandstone.	
								B						
s	3.50	4 /150	2 /75	2 /75	2 /75	3 /75						9		
										(3.25)				
								B						
s	4.50	3 /150	2 /75	3 /75	3 /75	5 /75		T				13		
								B						
s	5.50	11 /150	7 /75	9 /75	10 /75	10 /75		T		5.50		36		
										(1.00)			Medium dense brown SAND	
								B		6.50				
										(0.50)			Medium dense, brown sub-rounded and sub-angular sandy GRAVEL	
s	7.00	16 /150	12 /75	14 /75	25 /75					7.00		R	Very dense red-brown silty medium grained SAND	
s	8.50	25 /150	50 /75									R		
								B		(3.60)				
s	10.0	25 /150	50 /75									R		
										10.60				

General remarks

1) Groundwater encountered at 6.5m bgl and rising to 4m bgl. during drilling.
2) Water added during drilling from 6.5m bgl - 10.6m bgl.
3) Unable to effectively advance borehole beyond 10.6m bgl.
4) Borehole backfilled with arisings and surface reinstated with concrete.

Equipment: Cable Percussion

Borehole cased to 9m bgl

Logging Engineer: MJH

Approved

Key
T = Plastic Tub & Glass Jar
J = Glass Vial
B= Small Disturbed Sample
W = Water Sample
S = Standard Penetration Test (SPT)
C = Cone Penetration Test (CPT)
R = SPT / CPT Refusal
LB = Large Bulk
U = U100 Undisturbed Sample

Appendix B

Laboratory Test Results

Chemtest
The right chemistry to deliver results

Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070

Emcus
42 Mount Pleasant Drive
Belper
Derbyshire
DE56 2TH

FAO Marcus Hanford
02 August 2012

Dear Marcus Hanford

Test Report Number **210029**

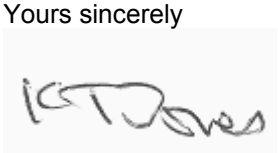
Your Project Reference **J1194A, Fermentation Building, Royal Brewery**

Please find enclosed the results of analysis for the samples received 25 July 2012.

All soil samples will be retained for a period of one month and all water samples will be retained for 7 days following the date of the test report. Should you require an extended retention period then please detail your requirements in an email to customerservices@chemtest.co.uk. Please be aware that charges may be applicable for extended sample storage.

If you require any further assistance, please do not hesitate to contact the Customer Services team.

Yours sincerely



Keith Jones, Technical Manager

UKAS TESTING
2183

ISO 14001 sira UKAS ENVIRONMENTAL MANAGEMENT

Notes to accompany report:

- *The sign < means 'less than'*
- *Tests marked 'U' hold UKAS accreditation*
- *Tests marked 'M' hold MCertS (and UKAS) accreditation*
- *Tests marked 'N' do not currently hold UKAS accreditation*
- *Tests marked 'S' were subcontracted to an approved laboratory*
- *n/e means 'not evaluated'*
- *i/s means 'insufficient sample'*
- *u/s means 'unsuitable sample'*
- *Comments or interpretations are beyond the scope of UKAS accreditation*
- *The results relate only to the items tested*
- *All results are expressed on a dry weight basis*
- *The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, phenols*
- *For all other tests the samples were dried at < 37°C prior to analysis*
- *Uncertainties of measurement for the determinands tested are available upon request*
- *None of the test results included in this report have been recovery corrected*

Emcus
42 Mount Pleasant Drive
Belper
Derbyshire
DE56 2TH

FAO Marcus Hanford

LABORATORY TEST REPORT

Results of analysis of 10 samples
received 25 July 2012

J1194A, Fermentation Building, Royal Brewery

Chemtest
The right chemistry to deliver results

Report Date
02 August 2012

Login Batch No					210029					
Chemtest LIMS ID					AH56453	AH56454	AH56455	AH56456	AH56457	AH56458
Sample ID					WS102	WS103	WS104	BH1	WS102	WS102
Sample No										
Sampling Date					20/7/2012	20/7/2012	20/7/2012	20/7/2012	20/7/2012	20/7/2012
Depth					0.8m	0.50m	1.00m	0.25m - 1.5m	3.80m	5.20m
Matrix					*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
SOP↓	Determinand↓	CAS No↓	Units↓	*						
2010	pH			M	8.6	8.9	8.4	8.8		
2300	Cyanide (free)	57125	mg kg-¹	M	<0.50	<0.50	<0.50	<0.50		
	Cyanide (total)	57125	mg kg-¹	M	<0.50	<0.50	<0.50	<0.50		
	Thiocyanate	302045	mg kg-¹	M	15	<5.0	23	<5.0		
2325	Sulfide (Easily Liberatable)	18496258	mg kg-¹	M	2.1	4.8	1.6	3.3		
2625	Organic matter		%	M	< 0.40	3.8	1.2	2.6		
2120	Boron (hot water soluble)	7440428	mg kg-¹	M	<0.4	<0.4	<0.4	<0.4		
	Sulfate (2:1 water soluble) as SO4	14808798	g l-¹	M	<0.01	0.02	<0.01	<0.01		
2490	Chromium (hexavalent)	18540299	mg kg-¹	N	<0.5	<0.5	<0.5	<0.5		
2430	Sulfate (total) as SO4	14808798	%	M	0.02	0.10	0.02	0.03		
2450	Arsenic	7440382	mg kg-¹	M	8.1	19	9.9	21		
	Cadmium	7440439	mg kg-¹	M	0.56	0.42	<0.10	0.61		
	Chromium	7440473	mg kg-¹	M	17	19	33	14		
	Copper	7440508	mg kg-¹	M	12	71	30	17		
	Mercury	7439976	mg kg-¹	M	<0.10	<0.10	<0.10	<0.10		
	Nickel	7440020	mg kg-¹	M	15	19	46	14		
	Lead	7439921	mg kg-¹	M	29	770	52	58		
	Selenium	7782492	mg kg-¹	M	<0.20	0.44	0.25	<0.20		
	Zinc	7440666	mg kg-¹	M	71	220	60	54		
2675	TPH aliphatic >C5-C6		mg kg-¹	N					< 0.1	< 0.1
	TPH aliphatic >C6-C8		mg kg-¹	N					< 0.1	< 0.1
	TPH aliphatic >C8-C10		mg kg-¹	N					< 0.1	< 0.1
	TPH aliphatic >C10-C12		mg kg-¹	M					4.7	< 1

All tests undertaken between 25/07/2012 and 01/08/2012

* Accreditation status

This report should be interpreted in conjuction with the notes on the accompanying cover page.

Emcus
42 Mount Pleasant Drive
Belper
Derbyshire
DE56 2TH

FAO Marcus Hanford

LABORATORY TEST REPORT

Results of analysis of 10 samples
received 25 July 2012

J1194A, Fermentation Building, Royal Brewery

Report Date
02 August 2012

Login Batch No					**210029**			
Chemtest LIMS ID					AH56459	AH56460	AH56461	AH56462
Sample ID					WS101	WS103	BH1	BH1
Sample No								
Sampling Date					20/7/2012	20/7/2012	20/7/2012	20/7/2012
Depth					1.60m	2.80m	7m - 7.45m	2.25m
Matrix					*SOIL*	*SOIL*	*SOIL*	*SOIL*
SOP↓	Determinand↓	CAS No↓	Units↓	*				
2010	pH			M		8.0	8.4	7.5
2300	Cyanide (free)	57125	mg kg-¹	M				
	Cyanide (total)	57125	mg kg-¹	M				
	Thiocyanate	302045	mg kg-¹	M				
2325	Sulfide (Easily Liberatable)	18496258	mg kg-¹	M				
2625	Organic matter		%	M				
2120	Boron (hot water soluble)	7440428	mg kg-¹	M				
	Sulfate (2:1 water soluble) as SO4	14808798	g l-¹	M		<0.01	<0.01	<0.01
2490	Chromium (hexavalent)	18540299	mg kg-¹	N				
2430	Sulfate (total) as SO4	14808798	%	M				
2450	Arsenic	7440382	mg kg-¹	M				
	Cadmium	7440439	mg kg-¹	M				
	Chromium	7440473	mg kg-¹	M				
	Copper	7440508	mg kg-¹	M				
	Mercury	7439976	mg kg-¹	M				
	Nickel	7440020	mg kg-¹	M				
	Lead	7439921	mg kg-¹	M				
	Selenium	7782492	mg kg-¹	M				
	Zinc	7440666	mg kg-¹	M				
2675	TPH aliphatic >C5-C6		mg kg-¹	N	< 0.1			
	TPH aliphatic >C6-C8		mg kg-¹	N	< 0.1			
	TPH aliphatic >C8-C10		mg kg-¹	N	< 0.1			
	TPH aliphatic >C10-C12		mg kg-¹	M	< 1			

* Accreditation status

This report should be interpreted in conjuction with the notes on the accompanying cover page.

Emcus
42 Mount Pleasant Drive
Belper
Derbyshire
DE56 2TH

FAO Marcus Hanford

LABORATORY TEST REPORT

Results of analysis of 10 samples
received 25 July 2012

J1194A, Fermentation Building, Royal Brewery

Chemtest
The right chemistry to deliver results

Report Date
02 August 2012

					210029					
					AH56453	AH56454	AH56455	AH56456	AH56457	AH56458
					WS102	WS103	WS104	BH1	WS102	WS102
					20/7/2012	20/7/2012	20/7/2012	20/7/2012	20/7/2012	20/7/2012
					0.8m	0.50m	1.00m	0.25m - 1.5m	3.80m	5.20m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2675	TPH aliphatic >C12-C16		mg kg-¹	M					65	2.4
	TPH aliphatic >C16-C21		mg kg-¹	M					57	3.4
	TPH aliphatic >C21-C35		mg kg-¹	M					16	< 1
	TPH aliphatic >C35-C44		mg kg-¹	N					< 1	< 1
	TPH aromatic >C5-C7		mg kg-¹	N					< 0.1	< 0.1
	TPH aromatic >C7-C8		mg kg-¹	N					< 0.1	< 0.1
	TPH aromatic >C8-C10		mg kg-¹	N					< 0.1	< 0.1
	TPH aromatic >C10-C12		mg kg-¹	M					2.7	< 1
	TPH aromatic >C12-C16		mg kg-¹	M					44	1.5
	TPH aromatic >C16-C21		mg kg-¹	M					190	1.8
	TPH aromatic >C21-C35		mg kg-¹	M					240	< 1
	TPH aromatic >C35-C44		mg kg-¹	N					< 1	< 1
	Total Petroleum Hydrocarbons		mg kg-¹	N					620	< 10
2700	Naphthalene	91203	mg kg-¹	M	< 0.1	3.1	< 0.1	0.4		
	Acenaphthylene	208968	mg kg-¹	M	< 0.1	0.67	< 0.1	< 0.1		
	Acenaphthene	83329	mg kg-¹	M	< 0.1	1.5	< 0.1	0.52		
	Fluorene	86737	mg kg-¹	M	< 0.1	1.3	< 0.1	0.26		
	Phenanthrene	85018	mg kg-¹	M	1.1	9.3	0.19	2.8		
	Anthracene	120127	mg kg-¹	M	0.37	1.7	< 0.1	0.64		
	Fluoranthene	206440	mg kg-¹	M	2.1	10	0.24	3.5		
	Pyrene	129000	mg kg-¹	M	1.8	10	0.5	3.6		
	Benzo[a]anthracene	56553	mg kg-¹	M	0.81	4.4	< 0.1	1.4		
	Chrysene	218019	mg kg-¹	M	1.2	6.1	< 0.1	1.6		
	Benzo[b]fluoranthene	205992	mg kg-¹	M	0.64	4.1	< 0.1	1.6		

All tests undertaken between 25/07/2012 and 01/08/2012

* Accreditation status

This report should be interpreted in conjuction with the notes on the accompanying cover page.

Emcus
42 Mount Pleasant Drive
Belper
Derbyshire
DE56 2TH

FAO Marcus Hanford

LABORATORY TEST REPORT

Results of analysis of 10 samples
received 25 July 2012

J1194A, Fermentation Building, Royal Brewery

Chemtest
The right chemistry to deliver results

Report Date
02 August 2012

					210029			
					AH56459	AH56460	AH56461	AH56462
					WS101	WS103	BH1	BH1
					20/7/2012	20/7/2012	20/7/2012	20/7/2012
					1.60m	2.80m	7m - 7.45m	2.25m
					SOIL	*SOIL*	*SOIL*	*SOIL*
2675	TPH aliphatic >C12-C16		mg kg-¹	M	< 1			
	TPH aliphatic >C16-C21		mg kg-¹	M	7.4			
	TPH aliphatic >C21-C35		mg kg-¹	M	130			
	TPH aliphatic >C35-C44		mg kg-¹	N	< 1			
	TPH aromatic >C5-C7		mg kg-¹	N	< 0.1			
	TPH aromatic >C7-C8		mg kg-¹	N	< 0.1			
	TPH aromatic >C8-C10		mg kg-¹	N	< 0.1			
	TPH aromatic >C10-C12		mg kg-¹	M	< 1			
	TPH aromatic >C12-C16		mg kg-¹	M	< 1			
	TPH aromatic >C16-C21		mg kg-¹	M	6.2			
	TPH aromatic >C21-C35		mg kg-¹	M	25			
	TPH aromatic >C35-C44		mg kg-¹	N	< 1			
	Total Petroleum Hydrocarbons		mg kg-¹	N	170			
2700	Naphthalene	91203	mg kg-¹	M				
	Acenaphthylene	208968	mg kg-¹	M				
	Acenaphthene	83329	mg kg-¹	M				
	Fluorene	86737	mg kg-¹	M				
	Phenanthrene	85018	mg kg-¹	M				
	Anthracene	120127	mg kg-¹	M				
	Fluoranthene	206440	mg kg-¹	M				
	Pyrene	129000	mg kg-¹	M				
	Benzo[a]anthracene	56553	mg kg-¹	M				
	Chrysene	218019	mg kg-¹	M				
	Benzo[b]fluoranthene	205992	mg kg-¹	M				

* Accreditation status

This report should be interpreted in conjuction with the notes on the accompanying cover page.

Emcus
42 Mount Pleasant Drive
Belper
Derbyshire
DE56 2TH

FAO Marcus Hanford

LABORATORY TEST REPORT

Results of analysis of 10 samples
received 25 July 2012

J1194A, Fermentation Building, Royal Brewery

Chemtest
The right chemistry to deliver results

Report Date
02 August 2012

					210029					
					AH56453	AH56454	AH56455	AH56456	AH56457	AH56458
					WS102	WS103	WS104	BH1	WS102	WS102
					20/7/2012	20/7/2012	20/7/2012	20/7/2012	20/7/2012	20/7/2012
					0.8m	0.50m	1.00m	0.25m - 1.5m	3.80m	5.20m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2700	Benzo[k]fluoranthene	207089	mg kg-¹	M	0.45	2.2	< 0.1	0.95		
	Benzo[a]pyrene	50328	mg kg-¹	M	0.6	4.6	< 0.1	2		
	Dibenzo[a,h]anthracene	53703	mg kg-¹	M	0.14	0.49	< 0.1	< 0.1		
	Indeno[1,2,3-cd]pyrene	193395	mg kg-¹	M	0.66	2.5	< 0.1	1.1		
	Benzo[g,h,i]perylene	191242	mg kg-¹	M	0.6	3	< 0.1	1.1		
	Total (of 16) PAHs		mg kg-¹	M	10	65	< 2	21		
2920	Phenols (total)		mg kg-¹	N	<0.3	<0.3	<0.3	<0.3		

All tests undertaken between 25/07/2012 and 01/08/2012

* Accreditation status

This report should be interpreted in conjuction with the notes on the accompanying cover page.

Emcus
42 Mount Pleasant Drive
Belper
Derbyshire
DE56 2TH

FAO Marcus Hanford

LABORATORY TEST REPORT

Results of analysis of 10 samples
received 25 July 2012

J1194A, Fermentation Building, Royal Brewery

Report Date
02 August 2012

					210029			
					AH56459	AH56460	AH56461	AH56462
					WS101	WS103	BH1	BH1
					20/7/2012	20/7/2012	20/7/2012	20/7/2012
					1.60m	2.80m	7m - 7.45m	2.25m
					SOIL	*SOIL*	*SOIL*	*SOIL*
2700	Benzo[k]fluoranthene	207089	mg kg-¹	M				
	Benzo[a]pyrene	50328	mg kg-¹	M				
	Dibenzo[a,h]anthracene	53703	mg kg-¹	M				
	Indeno[1,2,3-cd]pyrene	193395	mg kg-¹	M				
	Benzo[g,h,i]perylene	191242	mg kg-¹	M				
	Total (of 16) PAHs		mg kg-¹	M				
2920	Phenols (total)		mg kg-¹	N				

Emcus
42 Mount Pleasant Drive
Belper
Derbyshire
DE56 2TH

FAO Marcus Hanford

LABORATORY TEST REPORT
Asbestos in Soils

Results of analysis of 3 samples
received 25 July 2012
J1194A, Fermentation Building, Royal Brewery

Report Date
02 August 2012

Login Batch No: **210029**

Qualitative Results

				SOP 2190	
				ACM Type	Asbestos Identification
Chemtest ID	Sample ID	Sample Desc	Depth (m)		
AH56453		WS102	0.8	-	No Asbestos Detected
AH56454		WS103	0.50	-	No Asbestos Detected
AH56455		WS104	1.00	-	No Asbestos Detected

The detection limit for this method is 0.001%

Signed



Albert Vella
Senior Environmental Surveyor

Chemtest
The right chemistry to deliver results

Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070

Emcus
42 Mount Pleasant Drive
Belper
Derbyshire
DE56 2TH

FAO Marcus Hanford
03 August 2012

Dear Marcus Hanford

Test Report Number **210034**

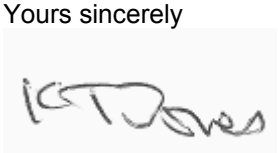
Your Project Reference **J1194A, Fermentation Building, Royal Brewery**

Please find enclosed the results of analysis for the samples received 25 July 2012.

All soil samples will be retained for a period of one month and all water samples will be retained for 7 days following the date of the test report. Should you require an extended retention period then please detail your requirements in an email to customerservices@chemtest.co.uk. Please be aware that charges may be applicable for extended sample storage.

If you require any further assistance, please do not hesitate to contact the Customer Services team.

Yours sincerely



Keith Jones, Technical Manager

UKAS TESTING
2183

ISO 14001 sira UKAS ENVIRONMENTAL MANAGEMENT

Notes to accompany report:

- *The sign < means 'less than'*
- *Tests marked 'U' hold UKAS accreditation*
- *Tests marked 'M' hold MCertS (and UKAS) accreditation*
- *Tests marked 'N' do not currently hold UKAS accreditation*
- *Tests marked 'S' were subcontracted to an approved laboratory*
- *n/e means 'not evaluated'*
- *i/s means 'insufficient sample'*
- *u/s means 'unsuitable sample'*
- *Comments or interpretations are beyond the scope of UKAS accreditation*
- *The results relate only to the items tested*
- *All results are expressed on a dry weight basis*
- *The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, phenols*
- *For all other tests the samples were dried at < 37°C prior to analysis*
- *Uncertainties of measurement for the determinands tested are available upon request*
- *None of the test results included in this report have been recovery corrected*

Newmarket • Tamworth • Glasgow
Registered in England & Wales - Registration Number 6511736 - Registered Office: 11 Depot Road Newmarket Suffolk CB8 0AL

LABORATORY TEST REPORT

CEN 10:1 CUMULATIVE TWO STAGE BATCH TEST

Emcus
42 Mount Pleasant Drive
Belper
Derbyshire
DE56 2TH

FAO Marcus Hanford

Results of analysis of 4 samples received 25 July 2012

J1194A, Fermentation Building, Royal Brewery

Report Date 3 August 2012

Login Batch No	**210034**
Chemtest LIMS ID	AH56466 Soil: AH56464
Sample ID	BH1
Sample No	
Sampling Date	20/07/2012
Depth	0.25m

Solid Waste Analysis

Determinand ↓	SOP ↓	*	Units ↓			Landfill Waste Acceptance Criteria Limits: Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon	2625	M	%		2.7	3	5	6
Loss on Ignition	2610	N	%		2.53			10
Total BTEX	2761	M	mg kg^{-1}		<0.005	6		
Total PCBs (7 congeners)	2811	N	mg kg^{-1}		<1	1		
TPH Total WAC	2670	M	mg kg^{-1}		64	500		
Total (of 17) PAHs	2700	N	mg kg^{-1}		86	100		
pH	2010	M			8.8		>6	
Acid Neutralisation Capacity	2015	N	mol kg^{-1}		0.063		To evaluate	To evaluate

Eluate Analysis

Determinand ↓	SOP ↓	*	2:1 Eluate mg l^{-1}	8:1 Eluate mg l^{-1}	2:1 Eluate mg kg^{-1}	Cumulative 10:1 Eluate mg kg^{-1}	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
Arsenic	1450	N	0.004	0.002	<0.05	<0.05	0.5	2	25
Barium	1450	N	0.063	0.04	<0.5	<0.5	20	100	300
Cadmium	1450	N	<0.0005	<0.0005	<0.01	<0.01	0.04	1	5
Chromium	1450	N	0.006	0.003	<0.05	<0.05	0.5	10	70
Copper	1450	N	0.001	<0.001	<0.05	<0.05	2	50	100
Mercury	1450	N	<0.0005	<0.0005	<0.01	<0.01	0.01	0.2	2
Molybdenum	1450	N	0.023	0.006	0.05	0.08	0.5	10	30
Nickel	1450	N	0.001	<0.001	<0.05	<0.05	0.4	10	40
Lead	1450	N	<0.001	<0.001	<0.01	<0.01	0.5	10	50
Antimony	1450	N	0.002	0.001	<0.01	0.01	0.06	0.7	5
Selenium	1450	N	0.012	0.004	0.02	0.05	0.1	0.5	7
Zinc	1450	N	0.003	0.001	<0.5	<0.5	4	50	200
Chloride	1220	N	6.9	0.78	13.8	15.5	800	15000	25000
Fluoride	1220	N	1.9	0.75	3.79	8.94	10	150	500
Sulfate	1220	N	36	8.3	71.9	118	1000	20000	50000
Total Dissolved Solids	1040	N	170	86	340	965	4000	60000	100000
Phenol Index	1920	N	<0.03	<0.03	<0.5	<0.5	1		
Dissolved Organic Carbon	1610	N	8.9	9.2	<50	91.6	500	800	1000

Solid Information

Dry mass of test portion/kg	0.175

Leach Test Information

Leachant volume 1st extract/l	0.328
Leachant volume 2nd extract/l	1.4
Eluate recovered from 1st extract/l	0.219

All tests undertaken between 25-Jul-2012 and 3-Aug-2012
* Accreditation status
This report should be interpreted in conjunction with the notes on the accompanying cover page.

LABORATORY TEST REPORT

CEN 10:1 CUMULATIVE TWO STAGE BATCH TEST

Emcus
42 Mount Pleasant Drive
Belper
Derbyshire
DE56 2TH

FAO Marcus Hanford

Results of analysis of 4 samples received 25 July 2012

J1194A, Fermentation Building, Royal Brewery

Report Date 3 August 2012

Login Batch No	**210034**
Chemtest LIMS ID	AH56467 Soil: AH56465
Sample ID	WS102
Sample No	
Sampling Date	20/07/2012
Depth	3.80m

Solid Waste Analysis

Determinand ↓	SOP ↓	*	Units ↓			Landfill Waste Acceptance Criteria Limits: Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon	2625	M	%		0.95	3	5	6
Loss on Ignition	2610	N	%		2.69			10
Total BTEX	2761	M	mg kg^{-1}		<0.005	6		
Total PCBs (7 congeners)	2811	N	mg kg^{-1}		<1	1		
TPH Total WAC	2670	M	mg kg^{-1}		160	500		
Total (of 17) PAHs	2700	N	mg kg^{-1}		96	100		
pH	2010	M			10.2		>6	
Acid Neutralisation Capacity	2015	N	mol kg^{-1}		0.05		To evaluate	To evaluate

Eluate Analysis

Determinand ↓	SOP ↓	*	2:1 Eluate mg l^{-1}	8:1 Eluate mg l^{-1}	2:1 Eluate mg kg^{-1}	Cumulative 10:1 Eluate mg kg^{-1}	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
Arsenic	1450	N	0.005	0.001	<0.05	<0.05	0.5	2	25
Barium	1450	N	0.026	0.016	<0.5	<0.5	20	100	300
Cadmium	1450	N	<0.0005	<0.0005	<0.01	<0.01	0.04	1	5
Chromium	1450	N	0.004	0.003	<0.05	<0.05	0.5	10	70
Copper	1450	N	0.013	0.009	<0.05	0.1	2	50	100
Mercury	1450	N	<0.0005	<0.0005	<0.01	<0.01	0.01	0.2	2
Molybdenum	1450	N	0.054	0.011	0.11	0.17	0.5	10	30
Nickel	1450	N	0.004	0.002	<0.05	<0.05	0.4	10	40
Lead	1450	N	<0.001	<0.001	<0.01	<0.01	0.5	10	50
Antimony	1450	N	0.008	0.003	0.02	0.04	0.06	0.7	5
Selenium	1450	N	0.006	0.003	0.01	0.03	0.1	0.5	7
Zinc	1450	N	0.002	0.001	<0.5	<0.5	4	50	200
Chloride	1220	N	87	27	174	353	800	15000	25000
Fluoride	1220	N	0.57	0.29	1.14	3.29	10	150	500
Sulfate	1220	N	110	40	220	497	1000	20000	50000
Total Dissolved Solids	1040	N	410	310	820	3240	4000	60000	100000
Phenol Index	1920	N	<0.03	<0.03	<0.5	<0.5	1		
Dissolved Organic Carbon	1610	N	15	8.9	<50	97.5	500	800	1000

Solid Information

Dry mass of test portion/kg	0.175

Leach Test Information

Leachant volume 1st extract/l	0.314
Leachant volume 2nd extract/l	1.4
Eluate recovered from 1st extract/l	0.2429

All tests undertaken between 25-Jul-2012 and 3-Aug-2012
* Accreditation status
This report should be interpreted in conjunction with the notes on the accompanying cover page.

Geonetix

Emcus Limited
42 Mount Pleasant Drive
Belper
Derbyshire
DE56 2TH

For the attention of Marcus Hanford

Dear Sirs

Our ref **12034**

Project **FERMENTATION BUILDING, ROYAL BREWERY**

Further to your instructions we have pleasure in enclosing the results of the tests you requested.

Testing was carried out in accordance with the specified methods and are detailed in the attached figures.

Figure / Table	Test Quantity	Description
1	~	Liquid & Plastic Limit Summary
2	1	Liquid & Plastic Limit
3 to 4	2	Particle Size Distribution

Any samples or residue taken will be retained for a maximum of 28 days from the date of issue of this report. Should you require a variation of this, which is our standard sample retention period, we reserve the right to charge a storage fee.

We trust that these results meet with your approval and would welcome any feedback you may have regarding our services, for your convienience this can be done through our website at **geonetix.co.uk**

Yours faithfully

Kevin Shorthouse
Technical Director

FERMENTATION BUILDING, ROYAL BREWERY

SUMMARY OF LIQUID AND PLASTIC LIMIT TESTS

BS1377:Part 2:1990

Sample Identification				Lab Sample ID	Description	Moisture Content	Atterberg Limts						
Borehole / Trial Pit	Depth m	Sample Ref	Sample Type			%	Liquid Limit %	Plastic Limit %	Plasticity Index %	Percentage Retained 425µm %	Atterberg Classification	Test Type	Sample Condition
WS104	2.50-3.00		B	220101	Brown CLAY with occasional gravel. Gravel is fine.	18	42	19	23	4	CI	1	1

Notes Test Type: 1 - 1 point cone penetrometer clause 4.4
2 - 4 point cone penetrometer clause 4.3
3 - Non plastic determination

Sample condition: 1 - As Received
2 - Air Dried
3 - Washed & Air Dried

Report Status	Approved	Notes
FINAL	09/08/2012	

Geonetix

Figure 1

Sheet 1 of 1

FERMENTATION BUILDING, ROYAL BREWERY

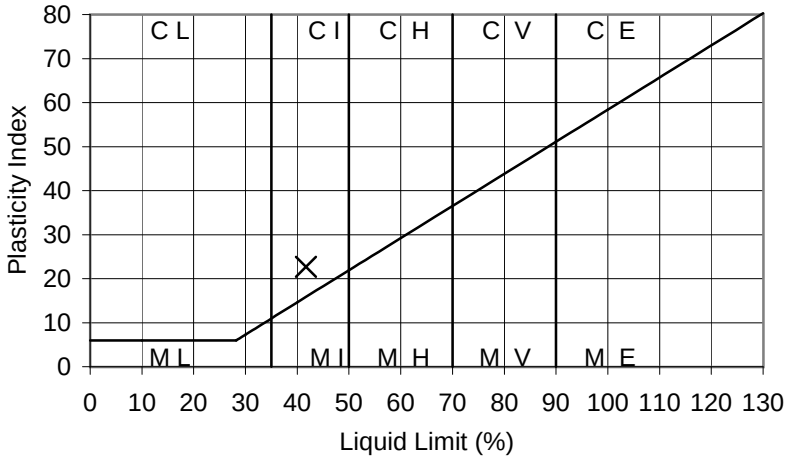
Hole ID	WS104
Sample Ref	
Depth (m)	2.50-3.00
Sample Type	B

LIQUID & PLASTIC LIMITS

BS1377 : Part 2 : 1990 Clauses 4.4 & 5

Non Engineering Description : Brown CLAY with occasional gravel. Gravel is fine.

Preparation : Sample as received



Results :

As Received Moisture Content : (BS1377:Part 2:Clause 3:1990)	18	%
Percentage retained on 425µm sieve :	4	%
Liquid Limit :	42	%
Plastic Limit :	19	%
Plasticity Index :	23	
Equivalent moisture content of material passing 425µm sieve :	19	%
Liquidity Index :	-0.01	

Report Status	Approved	Notes	Geonetix
FINAL	09/08/2012		Figure 2
			Sheet 1 of 1

FERMENTATION BUILDING, ROYAL BREWERY

Hole	BH1
Sample Ref	
Depth (m)	6.50-7.00
Sample Type	B

PARTICLE SIZE DISTRIBUTION

BS1377:Part 2:1990 Clause 9.2 - Wet Sieving

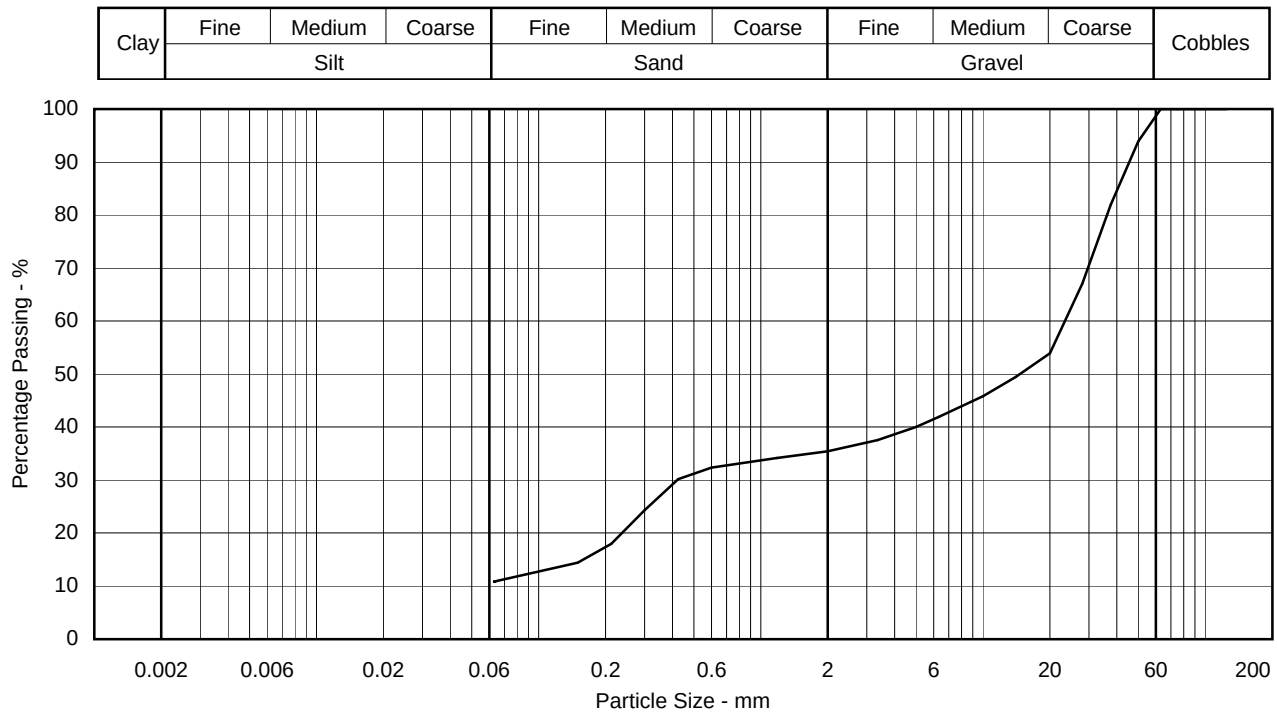
Particle Size	% Passing
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	94
37.5 mm	82
28.0 mm	67
20.0 mm	54
14.0 mm	49
10.0 mm	46
6.30 mm	42
5.00 mm	40
3.35 mm	38
2.00 mm	35
1.18 mm	34
600 µm	32
425 µm	30
300 µm	24
212 µm	18
150 µm	14
63 µm	11

Non Engineering Description
Brown SAND with much gravel. Gravel is fine to coarse

Sample Proportions - %	
Cobbles	1.4
Gravel	63.2
Sand	24.6
Silt & Clay	10.8

Particle Diameter - mm	
D100	63
D60	23
D10	
Uniformity Coefficient	N/A

Compliance Conditions



Report Status	Approved	Notes
FINAL	09/08/2012	

Geonetix

Figure 3

Sheet 1 of 1

FERMENTATION BUILDING, ROYAL BREWERY

Hole	BH1
Sample Ref	
Depth (m)	9.00-10.00
Sample Type	B

PARTICLE SIZE DISTRIBUTION

BS1377:Part 2:1990 Clause 9.2 - Wet Sieving

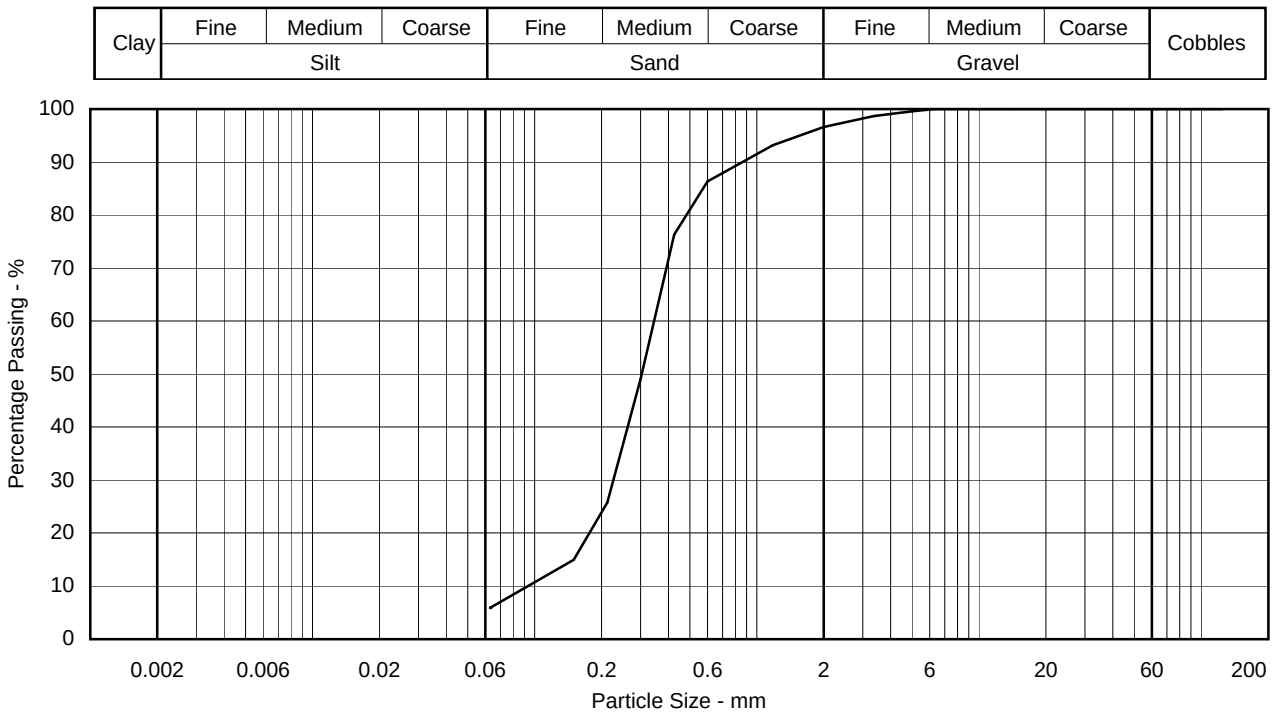
Particle Size	% Passing
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	100
20.0 mm	100
14.0 mm	100
10.0 mm	100
6.30 mm	100
5.00 mm	100
3.35 mm	99
2.00 mm	97
1.18 mm	93
600 µm	86
425 µm	76
300 µm	49
212 µm	26
150 µm	15
63 µm	6

Non Engineering Description
Brown SAND.

Sample Proportions - %	
Cobbles	0.0
Gravel	3.4
Sand	90.7
Silt & Clay	5.9

Particle Diameter - mm	
D100	6.3
D60	0.34
D10	0.094
Uniformity Coefficient	3.6

Compliance Conditions



Report Status	Approved	Notes
FINAL	09/08/2012	

Geonetix

Figure 4

Sheet 1 of 1