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ENDON RIDING SCHOOL
STANLEY MOSS LANE, ENDON

Ground Investigation Report

May 2017

Report No J17032/01

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1.0 INTRODUCTION

Spilman Associates Limited have been appointed by Humphries Builders Limited to carry out a ground investigation for a proposed residential development at Endon Riding School, Stanley Moss Lane, Endon, Stoke-on-Trent, Staffordshire, ST9 9LH.

This report presents the findings of an intrusive investigation and associated monitoring and laboratory testing.

An indicative development layout is shown on the Architect's drawing reproduced at Appendix A.

This report should be read in conjunction with the Lees Roxburgh Limited "Phase 1 Geoenvironmental Assessment (Desk Study)" dated August 2014 (Report No 5824/R1).

The above desk study contains a very detailed description of the site and its environs, however, for ease of reference a summary of key background information is reproduced within this report.

2.0 SITE LOCATION AND DESCRIPTION

2.1 Site Location

The site is located at National Grid Reference 392660E 352240N approximately 1km south of Endon (Figure 1).

2.2 Site Description

The site is irregularly shaped with approximate maximum dimensions of 100m by 80m (Figure 2). A topographic survey covering the site and the surrounding area has been provided and is reproduced at Appendix B.

The site is occupied by Endon Riding School at the centre of which is a large portal frame building used as an indoor arena. To the north of this are numerous timber stables and storage buildings. To the east of the main building is an open yard area in the north and the site's main residence to the south. Further residential, stable and storage buildings are located in the eastern part of the site.

There are two access points into the site from Stanley Moss Lane which forms the site's southern boundary. To the north of the site is a steep bank leading down to a west flowing stream.

There are a number of trees located within the site which are predominantly around the site perimeter.

Three above ground heating oil or diesel tanks are present within the site at locations shown on the plan at Appendix C.

3.0 SITE HISTORY

The site history has been assessed by reference to readily available historic Ordnance Survey (OS) Plans.

The 1st Edition 1880 OS Plan shows the majority of the site to comprise part of an open agricultural field. The existing main residence building and associated outbuildings are shown in the southeast part of the site and are marked as "Coltslow".

The site remains unchanged on the 1900, 1925, 1937, 1955, 1962 and 1968 OS Plans.

By 1982 the main portal frame building has been constructed together with several other smaller buildings. The site layout has remained largely unchanged up to the present day.

4.0 GEOLOGY

The site geology has been assessed by reference to the 1:50,000 scale Geological Map Sheet 123 (Stoke-on-Trent) published by the British Geological Survey.

The site is shown to directly underlain by glacial till deposits. Immediately to the west of the site glaciofluvial deposits are marked.

The natural superficial deposits are underlain by solid strata of the Bowland Shale Group (previously known as the Edale Shale Formation) of the Carboniferous Period. The Bowland Shale Formation comprises dark grey fissile and blocky mudstone, weakly calcareous with sequences of interbedded limestone and sandstone.

The dip of the solid strata is not recorded at the site, however, immediately to the south of the site a dip of 16 degrees is shown towards the east.

There are no recorded geological fault on the site, although a NNW-SSE trending fault is marked to the east of the site.

5.0 MINING

The site is not in an area impacted by recorded mining nor does it lie in an area where unrecorded mining could have occurred.

6.0 HYDROLOGY & HYDROGEOLOGY

6.1 Hydrology

The closest watercourse to the site is the west flowing stream located immediately to the north.

The main development area of the site does not lie within an area prone to fluvial flooding.

6.2 Hydrogeology

The solid strata underlying the site are classified as a Secondary A Aquifer by the Environment Agency in accordance with their Bedrock Aquifer Designation. The glacial till is classified as Unproductive Strata.

The site does not lie within a Groundwater Source Protection Zone as defined by the Environment Agency.

7.0 ENVIRONMENTAL DATABASE SEARCH

An Environmental Database Search was carried out for the site as part of the desk study and identified the following key issues:

- there is one recorded landfill site within 250m of the site. This was located 53m to the west of the site at Houghwood Bottom Farm. The records indicate that the deposited wastes included household waste and that deposition occurred between 1965 and 1971. The landfill is understood to have been operated by Leek District Council

- there are no recorded pollutions incidents within 250m of the site

- the site does not lie in an area where radon gas protection measures are required in new developments.

8.0 PRELIMINARY RISK ASSESSMENT

A preliminary contamination risk assessment carried out within the desk study suggested that:

> "…any risk of contamination can be considered to be low and the property is unlikely to be designated as "contaminated land" under Part IIA of the Environmental Protection Act 1990"

Nonetheless an intrusive investigation was recommended to include both soil contamination testing and ground gas monitoring.

9.0 GROUND INVESTIGATION

9.1 Site Works

The site works were carried out on 24th April 2017 and comprised the drilling of six mini-rig boreholes at locations shown on Figure 3.

The mini-rig boreholes were advanced by percussive techniques in 1m intervals. All boreholes were logged by a Geotechnical Engineer and detailed records are reproduced at Appendix D.

9.2 Insitu Testing

9.2.1 Standard Penetration Tests

Standard Penetration Tests (SPTs) were carried out at 1m intervals in all mini-rig boreholes. The test results are shown in full at Appendix E and summarised on the borehole records at Appendix D. The results are also shown graphically on Figure 4.

9.2.2 PID Screening

Selected soil samples were screened for volatile organic compounds using a portable Photoionisation Devise (PID). The test results are reproduced at Appendix F.

9.3 Instrumentation

Combined gas and groundwater monitoring standpipes were installed in BH2, BH3, BH4 and BH6. The installation details are shown on the borehole records at Appendix D.

Gas and groundwater level monitoring was carried out on six occasions. Monitoring was carried out with a portable infrared gas analyser (Gas Data GFM 436). Groundwater depths were determined with an electronic dipmeter.

The monitoring results are presented at Appendix G.

9.4 Laboratory Testing

9.4.1 Contamination Testing

Six near surface soil samples were tested for the following determinands:

- Former ICRCL Suite
- Speciated Polycyclic Aromatic Hydrocarbons (PAH)
- Total Petroleum Hydrocarbons (TPH) with an Aromatic/Aliphatic Split
- Asbestos Screen

An additional four soil samples were tested for TPH only.

The test results are reproduced at Appendix H.

Asbestos fibres were identified in one sample (BH2 at 0.10m) and further asbestos quantification was carried out on this sample. The results are presented at Appendix H.

9.4.2 Water Contamination Testing

Groundwater samples were obtained from BH3 and BH4 and a surface water sample was obtained from the stream to the north of the site (see Figure 3 for sampling location).

All three water samples were tested for TPH and BTEX compounds and the results are reproduced at Appendix I.

9.4.3 Geotechnical Testing

Selected soil samples were tested for the following parameters:

- Moisture Content
- Liquid Limit
- Plastic Limit
- Soluble Sulphate
- pH

The test results are reproduced at Appendix J. Index properties are shown on the plasticity chart at Figure 5.

10.0 GROUND CONDITIONS

10.1 Made Ground

A thin covering of made ground as identified in BH1, BH2, BH3 and BH4 with thicknesses in the range 0.15m to 0.35m.

In BH5 and BH6 made ground thicknesses were 1.25m and 1.80m. In BH5 the made ground comprised clayey sandy gravel with fragments of brick and concrete. In BH6 and upper granular layer of made ground extended to 0.55m with a firm clay to 0.95m and a very soft clay from 0.95m to 1.80m.

10.2 Original Topsoil

A thin layer of original topsoil was identified in BH1 (0.20m to 0.50m) and BH3 (0.35m to 0.80).

10.3 Glacial Till

The made ground and topsoil (where present) was underlain by glacial till in all boreholes except BH4. The glacial till generally comprised firm slightly sandy slightly gravelly clay.

10.4 Glaciofluvial Deposits

In BH4 the made ground was underlain by glaciofluvial deposits which comprised silty sand with varying amounts of gravel.

10.5 Bowland Shale

Solid strata of the Bowland Shale was identified in BH3 (5.20m), BH4 (4.30m) and BH5 (4.30m) and comprised very weak grey mudstone.

10.4 Groundwater

No groundwater was encountered during drilling in BH1, BH2 and BH6.

In BH3 groundwater was identified at 2.00m and in BH4 and BH5 at a depth of 4.00m.

Subsequent groundwater monitoring in four of the boreholes identified the following range of groundwater depths:

Borehole	Range of Groundwater Depths (m)
BH2	0.77 – 1.96
BH3	1.61 – 1.66
BH4	2.28 – 2.34
BH6	3.51 – >5.45

11.0 CONTAMINATION ASSESSMENT

11.1 Introduction

The legislative framework for managing the liabilities imposed by contaminated land in the UK is detailed within Part IIA of the Environmental Protection Act 1990. Under the Act contaminated land is defined as any land in, on or under which there are substances that cause significant harm or have the potential to cause significant harm to health or the environment or where pollution of controlled waters is being or is likely to be caused.

The environmental impact of the site has been considered using a risk-based approach incorporating the accepted Source-Pathway-Receptor model (“pollutant linkage”). The source is identified as a function of the nature of any contaminants which may be present. The receptor is the point in the environment at which damage may occur if the contaminant is

present at a level sufficient to cause harm. The pathway is the route in the environment by which the contaminant may be transferred from the source to the receptor. For there to be a significant risk there must be a link between an identified pollutant source and a receptor.

A conceptual site model has been developed for the site (see Figure 6) and a simple qualitative risk assessment has been carried out based on generic environmental standards as detailed below. Soil contamination test results are reproduced at Appendix H and are summarised on Table 1.

11.2 Visual and Olfactory Evidence

No visual or olfactory evidence of soil contamination was identified during the current investigation with the exception of a hydrocarbon odour in BH3 from 0.80m to 2.10m.

11.3 Human Health

11.3.1 Metals

The soil test results have been assessed against the published CLEA Soil Guideline Values (SGVs). Where no SGVs are available the results have been assessed against the LQM/CIEH S4ULs. Lead has been assessed against the potential Category 4 Screening Level (C4SL) of 200mg/kg in the absence of any updated CLEA SGVs. All results are based on a residential end-use. The test results are summarised below:-

Determinand	Values Detected (mg/kg)						Screening Value (mg/kg)
	BH1 0.25m	BH2 0.10m	BH3 0.40m	BH4 0.20m	BH5 0.35m	BH6 0.40m	
Arsenic	5	19	11	13	10	13	32
Boron	<1	<1	<1	<1	<1	<1	291
Cadmium	<1	1	<1	<1	<1	2	10
Chromium	10	23	15	17	15	18	910
Chromium VI	<1	<1	<1	<1	<1	<1	6
Copper	11	140	22	16	32	37	2330
Lead	44	97	63	53	110	480	200
Mercury	<1	<1	<1	<1	<1	1	170
Nickel	8	25	12	19	15	20	130
Selenium	<3	<3	<3	<3	<3	<3	350
Zinc	32	170	90	56	100	180	3750

Concentrations of all determinands except lead were below appropriate screening values.

Lead was elevated in BH6 at 0.40m with a concentration of 480mg/kg compared to the screening value of 200mg/kg.

11.3.2 Cyanide and Phenols

Concentrations of free cyanide and phenols were below the laboratory detection limit of 1.0mg/kg in all samples. Free cyanide concentrations were significantly below the screening value of 20mg/kg and phenol concentrations were below the screening value of 780mg/kg.

11.3.3 Polycyclic Aromatic Hydrocarbons (PAH)

Total PAH concentrations ranged from 0.1mg/kg to 26mg/kg.

All individual PAH compound concentrations were below the appropriate screening value with the exception of b/k fluoranthene in BH2 at 0.10m

11.3.4 Total Petroleum Hydrocarbons (TPH)

TPH concentrations for both aromatic and aliphatic compounds over all carbon ranges were below the appropriate screening value in all samples except BH3 at 1.50m.

BTEX compounds were at concentrations below the appropriate screening value in all samples.

11.3.5 Asbestos

Six samples were screened for asbestos with Chrysotile fibres detected in BH2 0.10m only. As asbestos quantification was carried out in this sample (see results at Appendix H) and recorded 0.002% asbestos.

11.4 Water Samples

Elevated TPH concentrations were identified in soil samples from BH3 (located adjacent to an existing above ground diesel oil storage tank). Accordingly a groundwater sample was obtained from this borehole and BH4 which lies between BH3 and the stream to the north. In addition a surface water sample was obtained from the stream.

All three samples were analysed for TPH and BTEX compounds and the results are reproduced at Appendix I.

BTEX compounds were absent in all three samples. TPH compounds were absent in BH4 with traces of TPH identified in BH3 (0.03mg/l Aliphatics C12-C16).

The surface water sample identified higher TPH concentrations than the groundwater sample from BH3 and concentrations above the laboratory detection limit were as follows:

Aliphatic (C12 – C16)	0.10mg/l
Aliphatic (C16 – C21)	0.06mg/l

11.5 Contamination Recommendations

11.5.1 General

A qualitative risk assessment has been carried out based on the accepted source-pathway-receptor pollutant linkages methodology. The assessment considers a site specific conceptual model designed from information obtained from the current investigation.

The principal receptors at the site are considered to be humans and controlled waters.

11.5.2 Human Health

Concentrations of all determinands were below recognised human health soil screening values with the exception of lead and TPH. These elevated concentrations pose a potential hazard with respect to human health without appropriate remedial measures.

Appropriate remedial measures should be designed to server the identified pollutant linkage. This could be achieved by the provision of a clean cover layer or the removal of impacted soils. The removal of impacted soils may not be cost-effective given the depth of made ground present in parts of the site.

The cover layer should comprise a minimum 600mm of clean topsoil and/or subsoil which will effectively isolate any residual contaminants from the site end-users thus breaking the identified pollutant linkage. No special measures are considered necessary beneath buildings, parking areas and other areas of hardstanding.

The traces of asbestos identified would also be adequately mitigated by the proposed clean cover layer.

Care should be taken to ensure that all imported materials are uncontaminated. Appropriate testing and validation of the remedial works should be carried out to the satisfaction of the Local Authority and Warranty Provider. The remedial works should be completed and validated before the development is first occupied.

11.5.3 Controlled Waters

Elevated soil concentrations of TPH were identified within a granular layer in BH3 at depths between 0.80m and 2.10m.

The source of these elevated TPH concentrations are considered to be from historic leakages or spill from the above ground diesel storage tank. The current tank is a modern self-bunded plastic tank, however, discussions with the site owner indicate that an unbunded steel diesel tank was previously used. It is anticipated that small scale spills and leakages either during tank filling or filling of individual vehicles (tractors) would have caused the current elevated TPH concentrations in soils.

A groundwater sample taken from BH3 identified only trace concentrations of aliphatic TPH in the range C12 – C16 (0.03mg/l). A groundwater sample from BH4 located midway between BH3 and the stream recorded an absence of TPH. This would tend to suggest that significant TPH migration towards the stream has not occurred.

More elevated TPH concentrations were recorded within the stream than identified in BH3. The inference being that the TPH impacts on the stream are unlikely to be from the site itself.

The investigation and testing carried out suggest that the identified localised TPH soil contamination is not currently impacting the nearby stream. However, during site development it is recommended that some further investigation be carried out in the vicinity of the diesel tank to determine any requirements for localised remedial works. Such works could include limited excavation and off-site disposal of hydrocarbon soils or small scale bioremediation to reduce TPH concentrations in soils.

11.5.4 Regulatory Approvals

The contamination conclusions and recommendations detailed in this report should be submitted to and approved by the Local Authority prior to commencement of any development works.

11.5.5 Unexpected Contamination

In the event of actual or suspected contamination not identified by this investigation being encountered during site development works then further advice should be sought and the Local Authority informed.

12.0 GROUND GASES

The desk study research identified a former landfill site 53m to the west of the site and accordingly a programme of ground gas monitoring was carried out.

Ground gas monitoring was carried out in four boreholes on six occasions. Gas monitoring results are detailed in full at Appendix G and are summarised below:

Borehole	Maximum CH_4%	Maximum CO_2%	Minimum O_2%
BH2	0.0	0.4	19.9
BH3	4.4	4.3	2.3
BH4	0.0	4.2	16.4
BH6	2.5	9.2	1.5

Borehole gas flow rates were less than 0.5 litres per hour in all boreholes on all monitoring visits. Atmospheric pressures during the monitoring ranged from 998 to 1006 millibars with two readings less than 1000 millibars.

Worst case Gas Screening Values (GSVs) for the site have been calculated as follows in accordance with CIRIA C665 (2007) Assessing Risks Posed by Hazardous Ground Gases to Buildings:

$GSV_{methane}$	0.022l/hr
$GSV_{carbon\ dioxide}$	0.046l/hr

These results do not exceed that threshold for a classification of Characteristic Situation 1. However, since the maximum methane concentration exceeds 1% and the maximum carbon dioxide concentration exceeds 5% then the classification should be advanced to Characteristic Situation 2 (CS2).

Borehole PID readings were very low in all boreholes except BH3 where readings ranged from 3.1ppm to 13.6ppm.

The elevated methane and carbon dioxide levels are such that gas protection measures should be provided to all buildings within the site. The nature of the gas protection measures can be determined in accordance with BS8485(2015) Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings.

A site classification of Characteristic Situation 2 (CS2) would require 3.5 points of protection in accordance with the British Standard which could be achieved as follows:

Item	Description	Points Score
(a)	Passive sub slab gas venting to achieve good performance (venting of open void via periscopic airbrick vents or similar)	1.5
(b)	Proprietary gas resistant membrane to entire building footprint, sealed around services penetrations and continuous across the cavity. Installation to be fully verified and tested in accordance with CIRIA C735 (2014)	2.0
	Total Points Score	3.5

In the vicinity of the above ground diesel tank where elevated TPH concentrations have been identified the proprietary gas resistant membrane should be upgraded to provide protection against the ingress of hydrocarbon vapours.

A detailed validation and verification report will be required in order to satisfy the requirement of the Local Authority.

13.0 ENGINEERING CONSIDERATIONS

13.1 Foundations

Conventional shallow strip foundations are recommended within the glacial till or glaciofluvial deposits. An allowable bearing pressure of 100kN/m^2 at a nominal depth of around 1.00m is considered appropriate for foundation design purposes. At this loading intensity settlements would be limited to acceptable levels.

Deeper foundations will be required in the vicinity of BH5 and BH6 where more significant thicknesses of made ground were identified (maximum thickness 1.80m in BH6). In these areas deep trench fill foundations should extend down through the full depths of the made ground into competent underlying natural strata.

Although not encountered by the current investigation it is anticipated that areas of deeper made ground may be present within the site associated with previous foundations or other infrastructure. Accordingly localised deepening of foundation excavations could be required to ensure that all foundations extend through all made ground and any disturbed ground.

In addition consideration should be given to the potential for shrinkage or heave associated with nearby trees (see Section 13.2 below).

All foundation excavations should be inspected and approved by the Building Inspector.

In the event of ground conditions differing from those identified by this investigation then further geotechnical advice should be sought.

13.2 Building Near Trees

There are trees around the site which could have the potential to cause heave or shrinkage of the clay soils.

Three clay samples indicated plasticity indices of 17 to 21 which equate to modified plasticity indices of 12 to 19 when taking into account the proportion of material passing the 0.425mm sieve.

In accordance with the NHBC Standards (2016) Chapter 4.2 Building Near Trees the clay soils would be classified as being of Low Volume Change (Shrinkage) Potential.

Foundation depths can be determined in accordance with NHBC Design Charts (or other similar guidance) taking into account the proximity, type and size of nearby trees.

Where necessary further advice on foundation design should be obtained from a Structural Engineer.

13.3 Floor Slabs

Due to the potential for shrinkage or heave and the localised presence of deeper made ground fully suspended beam and block type ground floor slabs are recommended.

13.4 Excavations

Excavations are anticipated to be of varying stability in the made ground and some excavation overbreak and instability should be anticipated. Excavations in the glacial till are anticipated to be stable in the short term, although more unstable conditions may exist within the glaciofluvial deposits identified in BH4.

Where man entry is required the excavation sides should be appropriately battered or shored in accordance with Health & Safety Executive Guidance.

13.5 Groundwater

Groundwater depths were variable across the site and consequently some groundwater ingress should be anticipated in shallow excavations.

It should be noted that groundwater levels can be subject to seasonal fluctuations and longer term groundwater monitoring has not been carried out.

13.6 Buried Concrete

Sulphate and pH test results indicate an appropriate design class for buried concrete of DS-1 in accordance with BRE Special Digest 1 (2005). The Aggressive Chemical Environment for Concrete (ACEC) class for the site would be AC-1 assuming mobile groundwater conditions.

13.7 Water Pipes

The elevated TPH concentrations may have the potential to impact conventional polyethylene water supply pipes. Accordingly, the water supply company should be contacted to confirm their precise requirements and the need or otherwise for specialist water supply pipework.

13.8 Slope Stability

There is a steep slope to the north of the site down to the stream. If development is proposed close to the crest of the slope then an assessment of stability may be required. Such an assessment is beyond the scope of this current report.

TABLES

TABLE 1: SUMMARY OF SOIL CONTAMINATION RESULTS

Borehole		BH1	BH2	BH3	BH4	BH5	BH6	BH3	BH3	BH3	BH3	CLEA SGV or
Depth (m)		0.25	0.10	0.40	0.20	0.35	0.40	1.50	2.00	2.50	4.50	LQM/CIEH S4UL
Arsenic	mg/kg	5	19	11	13	10	13	-	-	-	-	32
Boron	mg/kg	<1	<1	<1	<1	<1	<1	-	-	-	-	291
Cadmium	mg/kg	<1	1	<1	<1	<1	2	-	-	-	-	10
Chromium	mg/kg	10	23	15	17	15	18	-	-	-	-	910 [1]
Chromium VI	mg/kg	<1	<1	<1	<1	<1	<1	-	-	-	-	6
Copper	mg/kg	11	140	22	16	32	37	-	-	-	-	2330
Lead	mg/kg	44	97	63	53	110	480	-	-	-	-	200 [2]
Mercury	mg/kg	<1	<1	<1	<1	<1	1	-	-	-	-	170 [3]
Nickel	mg/kg	8	25	12	19	15	20	-	-	-	-	130
Selenium	mg/kg	<3	<3	<3	<3	<3	<3	-	-	-	-	350
Zinc	mg/kg	32	170	90	56	100	180	-	-	-	-	3750
Cyanide (free)	mg/kg	<1	<1	<1	<1	<1	<1	-	-	-	-	20 [4]
Phenols	mg/kg	<1	<1	<1	<1	<1	<1	-	-	-	-	780
Naphthalene	mg/kg	<0.1	1.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	2.3
Acenaphthylene	mg/kg	<0.1	<1.0	<0.1	<0.1	<0.1	<0.1	-	-	-	-	170
Acenaphthene	mg/kg	<0.1	<1.0	<0.1	<0.1	0.1	<0.1	-	-	-	-	210
Fluorene	mg/kg	<0.1	<1.0	<0.1	<0.1	<0.1	<0.1	-	-	-	-	170
Phenanthrene	mg/kg	<0.1	3.6	<0.1	<0.1	0.8	0.4	-	-	-	-	95
Anthracene	mg/kg	<0.1	<1.0	<0.1	<0.1	0.2	0.1	-	-	-	-	2400
Fluoranthene	mg/kg	0.3	5.8	0.2	<0.1	1.2	0.6	-	-	-	-	280
Pyrene	mg/kg	0.3	5.1	0.2	<0.1	1	0.6	-	-	-	-	620
Benzo(a)Anthracene	mg/kg	0.2	2.1	<0.1	<0.1	0.5	0.4	-	-	-	-	7.2
Chrysene	mg/kg	0.2	4.1	<0.1	<0.1	0.5	0.4	-	-	-	-	15
Benzo(b/k)Fluoranthene	mg/kg	0.4	3.1	0.2	<0.1	0.9	0.8	-	-	-	-	2.6/77 [5]
Benzo(a)Pyrene	mg/kg	0.2	1.4	<0.1	<0.1	0.5	0.4	-	-	-	-	2.2
Indeno(123-cd)Pyrene	mg/kg	<0.1	<1.0	<0.1	<0.1	0.3	0.2	-	-	-	-	27
Dibenzo(ah)Anthracene	mg/kg	<0.1	<1.0	<0.1	<0.1	<0.1	<0.1	-	-	-	-	0.24
Benzo(ghi)Perylene	mg/kg	<0.1	<1.0	<0.1	<0.1	0.3	0.3	-	-	-	-	320
PAH (Total)	mg/kg	1.5	26	0.5	<0.1	6.4	4.3	-	-	-	-	N/A
Benzene	ug/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	330
EthylBenzene	ug/kg	<10	<10	<10	<10	<10	<10	<10	<10	33	27	350,000
Meta/Para-Xylene	ug/kg	<10	16	<10	<10	<10	<10	<10	<10	16	14	240,000 [6]
Ortho-Xylene	ug/kg	<10	23	<10	<10	<10	<10	<10	<10	<10	<10	250,000
Toluene	ug/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	610,000
TPH (C5 - C6 Aliphatic)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	42
TPH (C6 - C8 Aliphatic)	mg/kg	<0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	100
TPH (C8 - C10 Aliphatic)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	16	3.7	<0.1	<0.1	27
TPH (C10 - C12 Aliphatic)	mg/kg	<1	<10	<1	<1	<10	<10	210	21	1	2	130
TPH (C12 - C16 Aliphatic)	mg/kg	<2	<10	<2	<2	<10	<10	740	90	7	7	1100
TPH (C16 - C21 Aliphatic)	mg/kg	<1	<10	<1	<1	<10	<10	420	66	3	3	65,000 [7]
TPH (C21 - C35 Aliphatic)	mg/kg	<4	36	<4	<4	<10	<10	220	29	<4	<4	65,000 [7]
TPH (C35 - C44 Aliphatic)	mg/kg	<1	<10	<1	<1	<10	<10	<10	<1	<1	<1	65,000
TPH (C6 - C7 Aromatic)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	70
TPH (C7 - C8 Aromatic)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	130
TPH (C8 - C10 Aromatic)	mg/kg	<0.1	3.8	<0.1	<0.1	<0.1	<0.1	2	0.24	<0.1	<0.1	34
TPH (C10 - C12 Aromatic)	mg/kg	<1	<10	<1	<1	<10	<10	96	6	<1	<1	74
TPH (C12 - C16 Aromatic)	mg/kg	<1	<10	2	<1	<10	<10	190	14	<1	<1	140
TPH (C16 - C21 Aromatic)	mg/kg	2	38	3	<1	13	<10	140	6	<1	<1	260
TPH (C21 - C35 Aromatic)	mg/kg	6	120	8	<1	46	<10	<10	<1	<1	<1	1100
TPH (C35 - C44 Aromatic)	mg/kg	<1	<10	<1	<1	<10	<10	<10	<1	<1	<1	1100

[1] S4UL quoted is for Chromium III

[2] Results assessed against Category 4 Screening Level

[3] Total Mercury concentration assessed against SGV for inorganic mercury

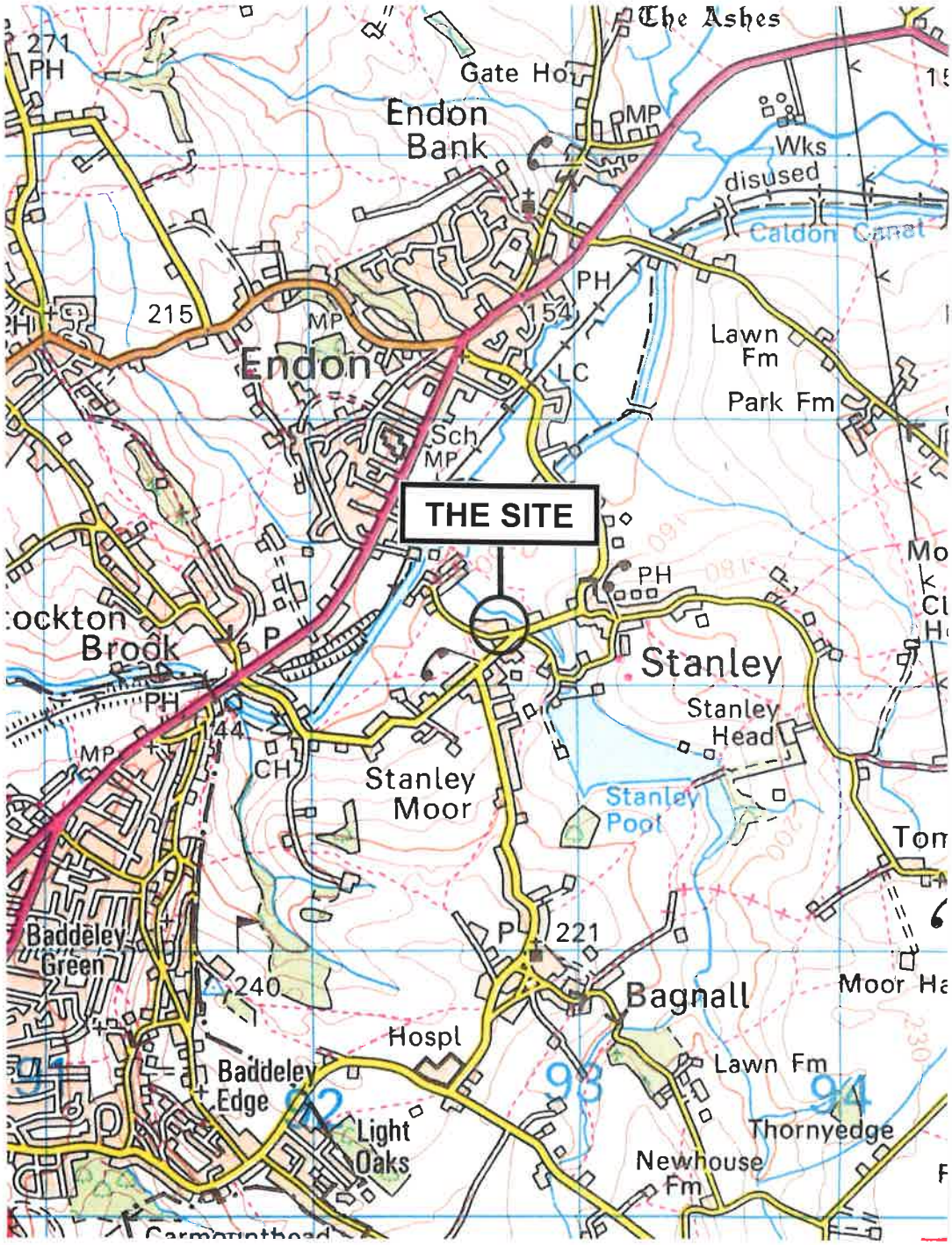
[4] Assessed against Dutch Intervention Value

[5] Analysis does not separate benzo(b)fluoranthene and benzo(k)fluoranthene

[6] SGV for m-xylene 240mg/kg and for p-xylene 230mg/kg

[7] S4UL of 65,000mg/kg for aliphatic C16 - C35

FIGURES

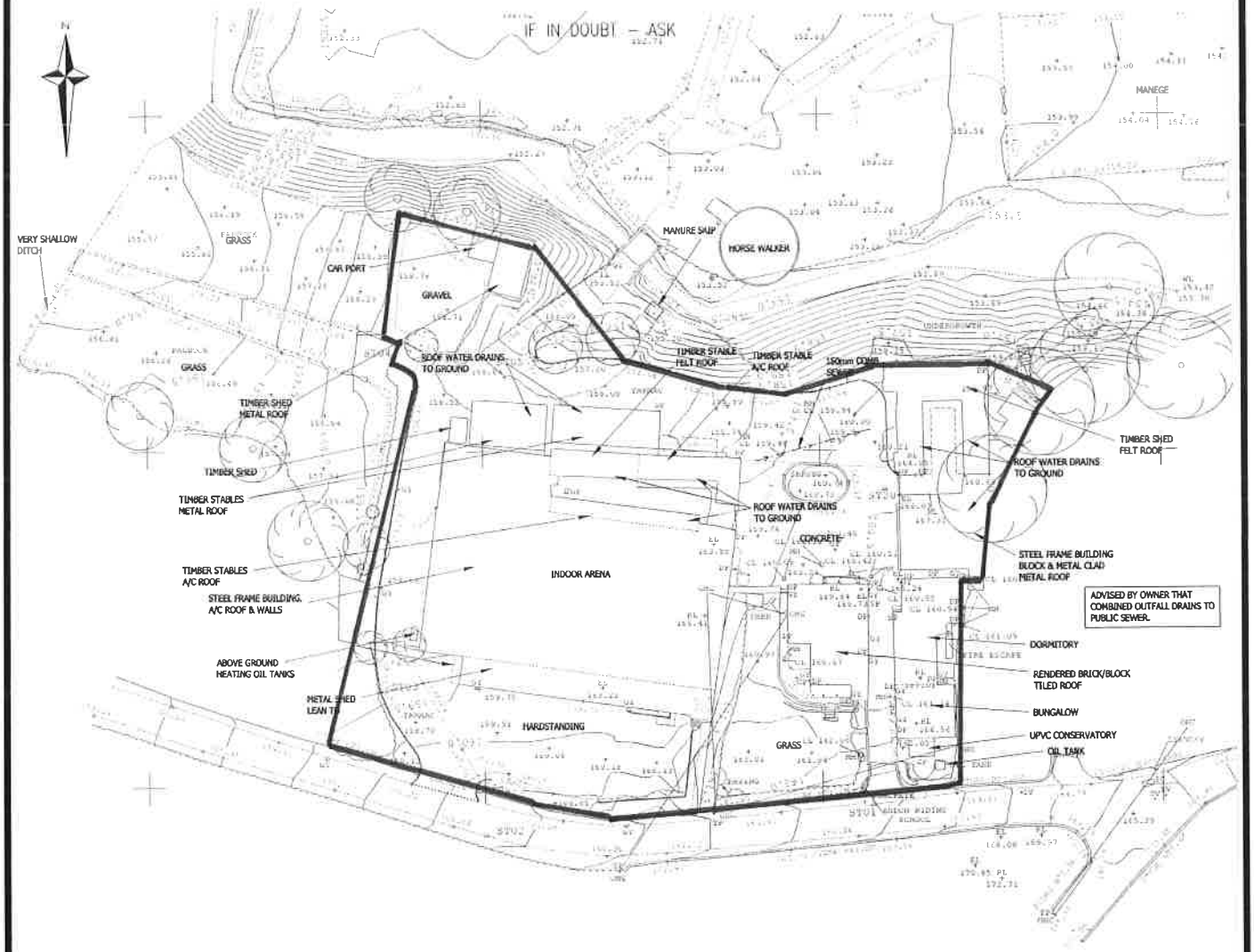


SPILMAN ASSOCIATES
Geotechnical & Environmental Engineers

Tel: 01384 820578
Fax: 01384 823251

Client	Title
Humphries Builders Limited	Site Location Plan
Scheme: Endon Riding School, Endon	

Date	Ref	Scale	Fig
May 2017	J17032/01	1: 25,000	1

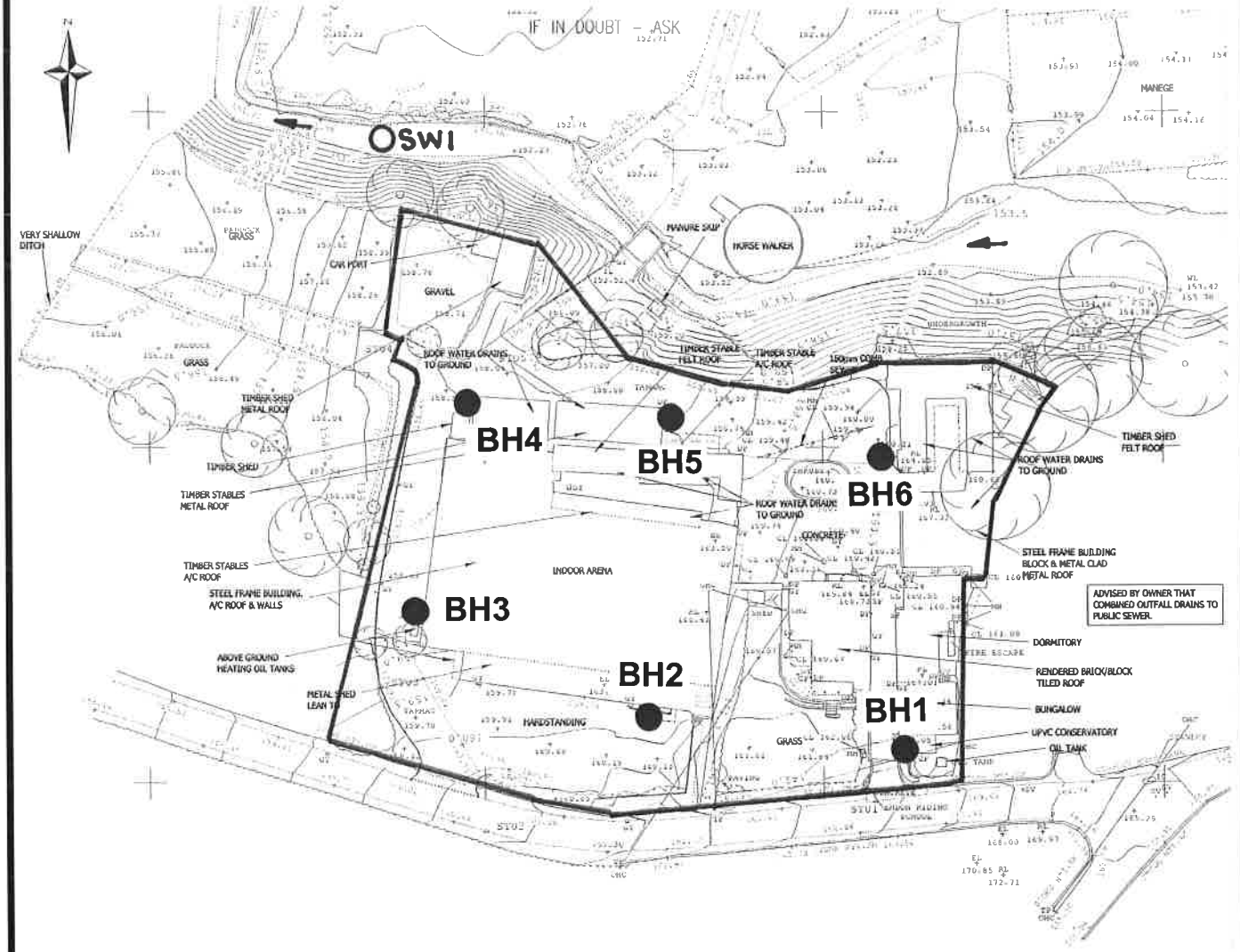


SPILMAN ASSOCIATES
Geotechnical & Environmental Engineers

Tel: 01384 820578
Fax: 01384 823251

Client	Title
Humphries Builders Limited	Site Layout Plan
Scheme: Endon Riding School, Endon	

Date	Ref	Scale	Fig
May 2017	J17032/01	1:1000	2



KEY

● BOREHOLE

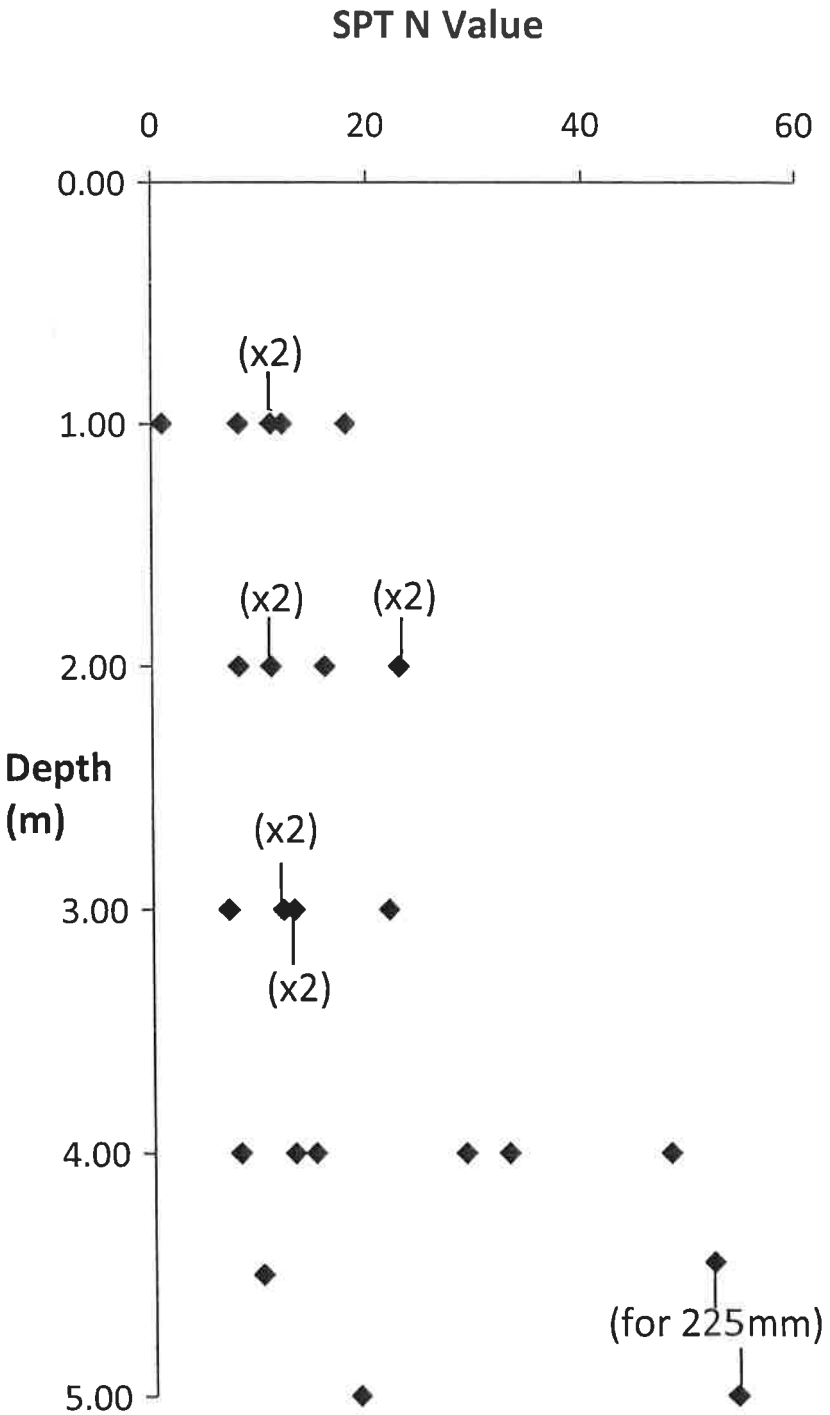
○ SURFACE WATER SAMPLING POINT

SPILMAN ASSOCIATES
Geotechnical & Environmental Engineers

Tel: 01384 820578
Fax: 01384 823251

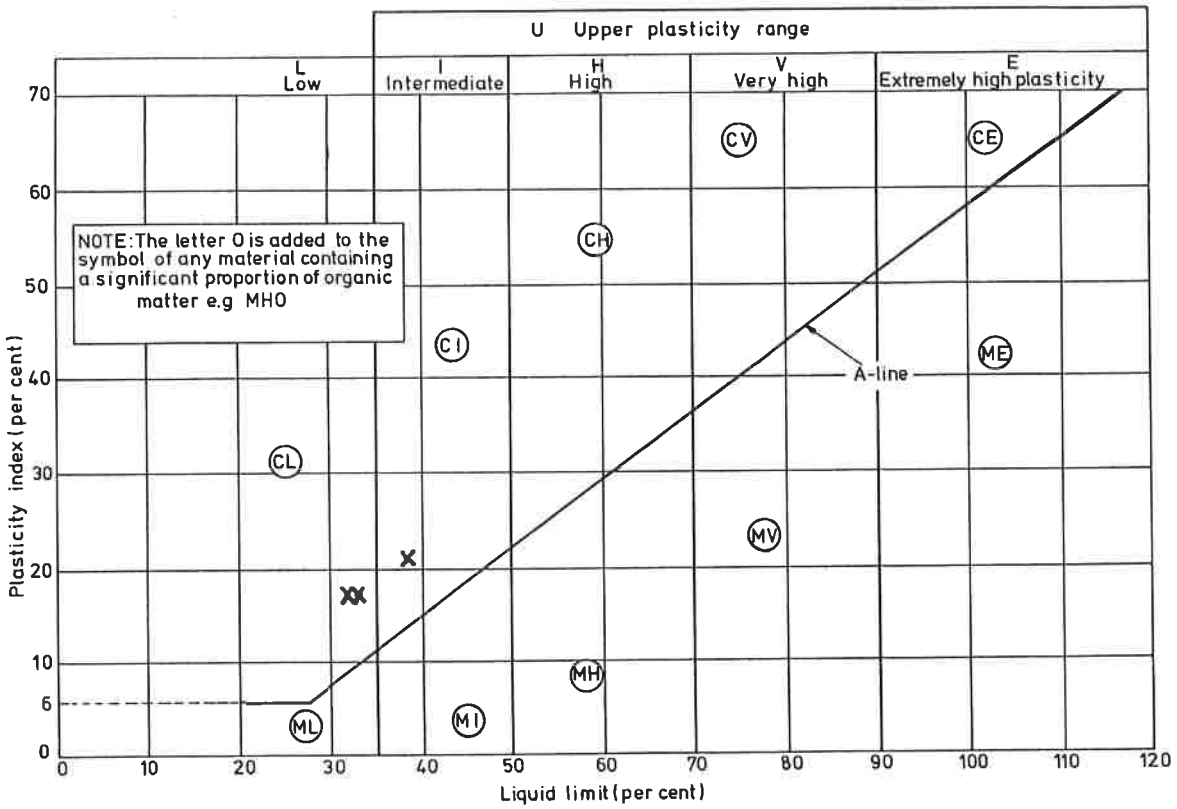
Client	Title
Humphries Builders Limited	Borehole Location Plan
Scheme: Endon Riding School, Endon	

Date	Ref	Scale	Fig
May 2017	J17032/01	1:1000	3

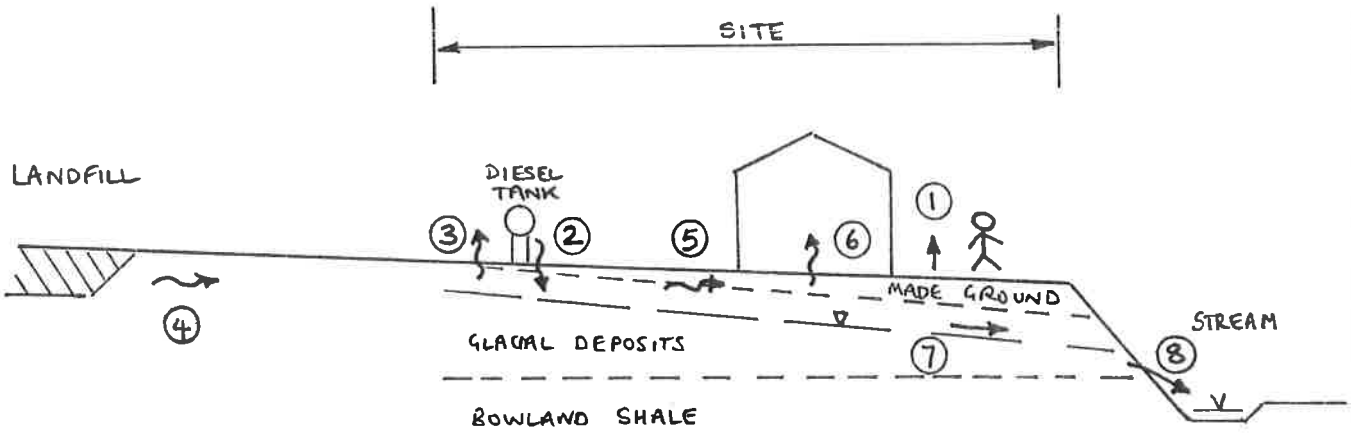


SPILMAN ASSOCIATES Geotechnical & Environmental Engineers Tel: 01384 820578 Fax: 01384 823251	Client Humphries Builders Limited		Title SPT N Value vs Depth	
	Scheme Endon Riding School, Endon			
	Date May 2017	Ref J17032/01	Scale Not to Scale	Fig 4

M SILT (M-soil) - below A-line
C CLAY - above A-line
} M and C may be combined as F, FINE SOIL



SPILMAN ASSOCIATES Geotechnical & Environmental Engineers Tel: 01384 820578 Fax: 01384 823251	Client Humphries Builders Limited		Title Plasticity Chart	
	Scheme Endon Riding School, Endon			
	Date May 2017	Ref J17032/01	Scale Not to Scale	Fig 5



1. HUMAN HEALTH EXPOSURE PATHWAY FROM NEAR SURFACE CONTAMINATION
2. HISTORIC SPILLS OF DIESEL TO GROUND AND GROUNDWATER
3. HYDROCARBON VAPOURS FROM SOILS
4. GAS MIGRATION FROM LANDFILL
5. GAS MIGRATION FROM ON-SITE BIODEGRADABLE MADE GROUND
6. GAS/VAPOUR INGRESS TO BUILDINGS
7. GROUNDWATER MOVEMENT DOWN HYDRAULIC GRADIENT
8. GROUNDWATER INGRESS TO STREAM

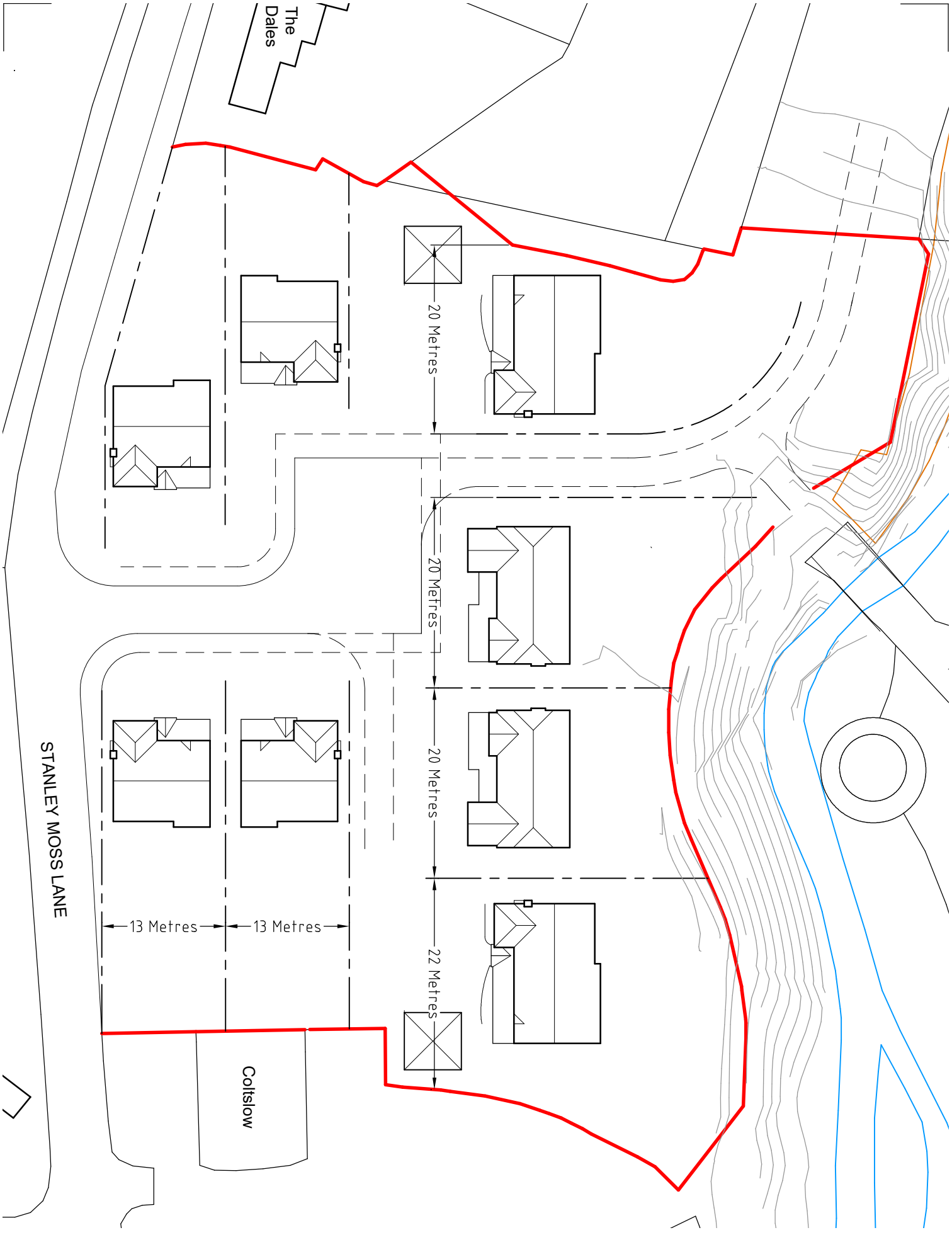
SPILMAN ASSOCIATES
Geotechnical & Environmental Engineers

Tel: 01384 820578
Fax: 01384 823251

Client	Title
Humphries Builders Limited	Conceptual Model
Scheme	
Endon Riding School, Endon	

Date	Ref	Scale	Fig
May 2017	J17032/01	Not to Scale	6

APPENDIX A

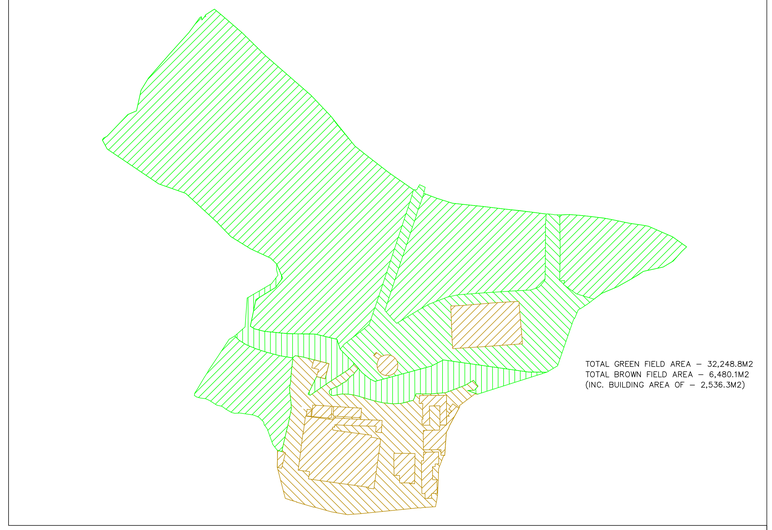


David Tatton Architect

4 CHURCH BANK, KEELE, STAFFORDSHIRE. ST5 5AT.
TEL 01782 619522 MOBILE 07748 385590 mail@davidtattonarchitects.net

CLIENT	PROJECT	DRAWING	SCALE	DWG.NO.	
Humphries Builders Ltd.	Endon Riding School	Sketch 2	1/500 @A4	113/02	
				DATE March. 2017.	REV

APPENDIX B



LEGEND

ST01	Control Station
BU	Bush
	Tree
	Hedge
	Foliage
	Existing Building
50.0	Contour

AV	Air Valve
B	Bollard
BH	Borehole
BIN	Bin
BM	Bench Mark
BS	Bus Stop
BSW	Breather Switch
BT	BT Inspection Cover
BU	Bush
CAT	Road Stud
C/B	Closed Boarded Fence
CC	CCTV
CL	Cover Level
C/L	Chain Link Fence
CP	Concrete Paving
CTV	CTV Cover
DK	Drop Kerb
DP	Downpipe
EB	Electricity Control Box
EL	Eaves Level
EP	Electricity Pole
ER	Earthing Rod
FFL	Finished Floor Level
FH	Fire Hydrant
FP	Flag Pole
GL	Ground Level
GP	Gate Post
GV	Gas Valve
GY	Gully
IC	Inspection Cover
IL	Invert Level
JB	Junction Box
KO	Kerb Outlet
I/R	Iron Railings
LC	Lighting Colum
LHT	Light Height
LP	Lamp Post
MG	Multi Girth Tree
MH	Manhole Cover
MK	Marker Post
MP	Mile Post
MS	Mile Stone Marker
NP	Street Name Plate
OHC	Overhead Cable
P	Post
PB	Post Box
PE	Pipe
PM	Parking Meter
P/R	Post & Rail Fence
P/W	Post & Wire Fence
PYL	Electricity Pylon
RE	Rodding Eye
RL	Ridge Level
RS	Road Sign
R/W	Retaining Wall
SL	Soffit Level
SP	Sign Post
SV	Stop Valve
SY	Stay Wire
TCB	Telephone Call Box
TH	Threshold Level
TL	Traffic Light
TP	Telegraph Pole
TS	Tree Stump
TV	Cable TV Inspection Cover
VP	Vent Pipe
WL	Water Level
WM	Water Meter
W/M	Wire Mesh Fence
WO	Wash Out

CONTROL SCHEDULE

Name	Easting	Northing	Level
ST01	392707.553	352197.202	162.852
ST02	392650.083	352192.882	160.830
ST03	392634.549	352214.303	159.255
ST04	392636.640	352263.124	158.799
ST05	392657.949	352263.566	157.591
ST20	392709.575	352244.152	160.384

Rev.	Description	By	Date
A	Added Areas	RM	08/13

SURVEYED ON: 19th & 22/07/13

BENCH MARK INFORMATION
3D Coordinate System is based on OS GPS Active Network

SHEET LAYOUT PLAN

Sheet 1

Sheet 1 of 1

AIRD GROUP
CHARTERED SURVEYORS & CONSULTING ENGINEERS
Incorporating Aird Development Services, Aird Geomatics, Aird Consulting Engineers & Aird Associates

1st Floor, 68 Marsland Road
Sale
Manchester
M33 3HG
Tel: 0161 973 8500
Fax: 0161 973 8505
Website: www.airdgroup.co.uk
Email: ads@airdgroup.co.uk

Edinburgh Tel:0131 332 6888 Fax:0131 332 7766
Glasgow Tel:0141 644 1729 Fax:0141 644 1730

CLIENT
DOLPHIN LAND DEVELOPMENTS

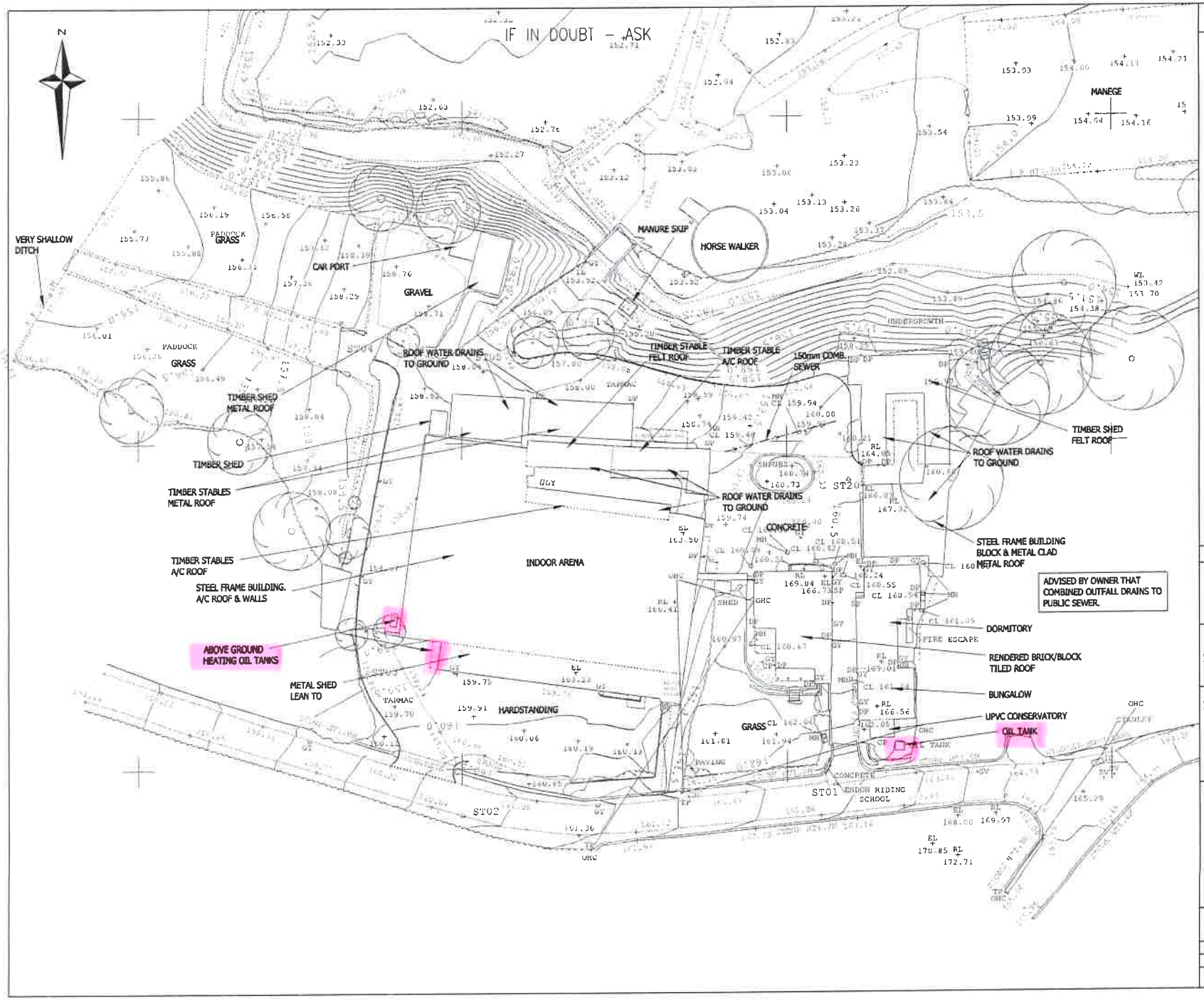
PROJECT
ENDON RIDING SCHOOL

TITLE
TOPOGRAPHICAL SURVEY

DRAWING No. M/DLD/13/005/001

DRAWN BY:	SCALE:	DATE:
RM	1:500 @ A0	20.08.13
CHECKED BY: RP		

APPENDIX C



Notes

Rev	REVISION	By	Date

ENDON RIDING SCHOOL
STONE ON TRENT

SITE FEATURES
PLAN

LEES ROXBURGH Consulting Engineers
THE GENESIS CENTRE, SCIENCE PARK SOUTH,
BIRCHWOOD, WARRINGTON, CHESHIRE, WA3 7BH
Tel 01925 812898 Fax 01925 838864

Job No	Drawing No	Revision
5824	01–01	–

Scale	NOT TO SCALE @A3	Date	AUG 2014
Drawn By	Designed By	Checked By	
MF	MF	JEL	

APPENDIX D

Spilman Associates
38 South Avenue
Stourbridge
West Midlands
DY8 3XY

01384 820578 tel

MINI RIG BOREHOLE RECORD

BH No. **BH1**

Site Location Endon Riding School, Stanley Moss Lane, Endon

Client Name Humphries Builders Limited

Job No. J17032

Date of Drilling 24/04/17 **Grid Ref**

Strata Depth (m)	Sample Depth (m)	Strata Description	Legend	Casing and Test Record	Water/ *Reduced* Levels (m)
0.00		Concrete paving slab over sand (MADE GROUND)			
0.20		Grey brown slightly sandy silt (ORIGINAL TOPSOIL)			
0.50		Soft to firm mottled grey and light brown slightly sandy slightly gravelly CLAY (GLACIAL TILL)		SV 38/42/40 kN/m^2 SPT N = 11	
1.50		Firm occasionally stiff mottled grey brown slightly sandy slightly gravelly CLAY (GLACIAL TILL) …becoming grey below 2.20m with occasional thin sand bands		SV 92/86/100 kN/m^2 SPT N = 23 SPT N = 12 SV 64/58/61 kN/m^2 SPT N = 13	
4.45					

Key to samples/in situ tests:-

D	Disturbed
B	Bulk
U	Undisturbed
W	Water
SPT	Standard Penetration Test
CPT	Cone Penetration Test
N	N value

Remarks:-

1. No groundwater encountered

Spilman Associates
38 South Avenue
Stourbridge
West Midlands
DY8 3XY

01384 820578 tel

MINI RIG BOREHOLE RECORD

BH No. **BH2**

Site Location Endon Riding School, Stanley Moss Lane, Endon

Client Name Humphries Builders Limited

Job No. J17032

Date of Drilling 24/04/17 **Grid Ref**

Strata Depth (m)	Sample Depth (m)	Strata Description	Legend	Casing and Test Record	Water/ *Reduced* Levels (m)
0.00		Grey silty sandy gravel of roadstone (MADE GROUND)			
0.30		Firm grey brown sandy gravelly CLAY (GLACIAL TILL)		SPT N = 8	
				SV 72/84/75 kN/m^2	
1.60		Firm grey slightly sandy gravelly CLAY (GLACIAL TILL)		SPT N = 8	
				SV 52/49/58 kN/m^2	
		…very silty from 2.60m to 3.60m		SPT N = 12	
				SPT N = 29	
		…becoming very stiff at 4.45m		SPT N = 52 for 225mm	
4.83					

Key to samples/in situ tests:-

D	Disturbed
B	Bulk
U	Undisturbed
W	Water
SPT	Standard Penetration Test
CPT	Cone Penetration Test
N	N value

Remarks:-

1. No groundwater encountered
2. Slotted 50mm ID HDPE from 0.50m to 4.50m with pea gravel surround. Plain pipe from surface to 0.50m with bentonite seal. Pipe capped with bung and gas tap in stopcock type cover

Spilman Associates
38 South Avenue
Stourbridge
West Midlands
DY8 3XY

01384 820578 tel

MINI RIG BOREHOLE RECORD

BH No. BH3

Site Location Endon Riding School, Stanley Moss Lane, Endon

Client Name Humphries Builders Limited

Job No. J17032

Date of Drilling 24/04/17 **Grid Ref**

Strata Depth (m)	Sample Depth (m)	Strata Description	Legend	Casing and Test Record	Water/ *Reduced* Levels (m)
0.00		Tarmac over brown sandy gravel of roadstone (MADE GROUND)			
0.35		Firm brown sandy silt (ORIGINAL TOPSOIL)			
0.80		Soft to firm grey brown very sandy gravelly CLAY (GLACIAL TILL)		SPT N = 12	
1.50		Medium dense brown and grey brown very gravelly SAND (GLACIAL TILL)		SPT N = 11	
2.10		Firm becoming stiff grey slightly sandy gravelly CLAY (GLACIAL TILL)		SPT N = 13	
				SPT N = 15	
5.20				SPT N = 54 for 225mm	
5.38		Very weak black carbonaceous MUDSTONE (BOWLAND SHALE)			

Key to samples/in situ tests:-

D	Disturbed
B	Bulk
U	Undisturbed
W	Water
SPT	Standard Penetration Test
CPT	Cone Penetration Test
N	N value

Remarks:-

1. Groundwater encountered at 2.00m
2. Hydrocarbon odour 0.80m to 2.10m
3. Slotted 50mm ID HDPE from 0.50m to 5.00m with pea gravel surround. Plain pipe from surface to 0.50m with bentonite seal. Pipe capped with bung and gas tap in stopcock type cover

Spilman Associates
38 South Avenue
Stourbridge
West Midlands
DY8 3XY

01384 820578 tel

MINI RIG BOREHOLE RECORD

BH No. BH4

Site Location Endon Riding School, Stanley Moss Lane, Endon

Client Name Humphries Builders Limited

Job No. J17032

Date of Drilling 24/04/17 **Grid Ref**

Strata Depth (m)	Sample Depth (m)	Strata Description	Legend	Casing and Test Record	Water/ *Reduced* Levels (m)
0.00		Tarmac over roadstone (MADE GROUND)			
0.15		Medium dense orange brown slightly silty slightly gravelly SAND (GLACIOFLUVIAL DEPOSITS)		SPT N = 18	
1.50		Medium dense red brown, orange brown and brown slightly silty SAND (GLACIOFLUVIAL DEPOSITS)		SPT N = 16 SPT N = 13 SPT N = 48	
4.30		Very weak grey MUDSTONE (BOWLAND SHALE)			
4.45					

Key to samples/in situ tests:-

D	Disturbed
B	Bulk
U	Undisturbed
W	Water
SPT	Standard Penetration Test
CPT	Cone Penetration Test
N	N value

Remarks:-

1. Groundwater encountered at 4.00m
2. Borehole unstable below 3.00m
3. Slotted 50mm ID HDPE from 0.50m to 3.00m with pea gravel surround. Plain pipe from surface to 0.50m with bentonite seal. Pipe capped with bung and gas tap in stopcock type cover

Spilman Associates
38 South Avenue
Stourbridge
West Midlands
DY8 3XY

01384 820578 tel

MINI RIG BOREHOLE RECORD

BH No. **BH5**

Site Location Endon Riding School, Stanley Moss Lane, Endon

Client Name Humphries Builders Limited

Job No. J17032

Date of Drilling 24/04/17 **Grid Ref**

Strata Depth (m)	Sample Depth (m)	Strata Description	Legend	Casing and Test Record	Water/ *Reduced* Levels (m)
0.00		Tarmac over roadstone (MADE GROUND)			
0.30		Loose brown and grey clayey sandy gravel with fragments of brick and concrete (MADE GROUND)		SPT N = 11	
1.25		Firm mottled greenish brown and grey slightly sandy slightly gravelly CLAY (GLACIAL TILL)		SPT N = 11	
				SPT N = 7	
		…becoming grey with many mudstone fragments at 4.00m		SPT N = 33	
4.30		Very weak grey MUDSTONE (BOWLAND SHALE)			
4.45					

Key to samples/in situ tests:-

D	Disturbed
B	Bulk
U	Undisturbed
W	Water
SPT	Standard Penetration Test
CPT	Cone Penetration Test
N	N value

Remarks:-

1. Groundwater encountered at 4.00m

Spilman Associates
38 South Avenue
Stourbridge
West Midlands
DY8 3XY

01384 820578 tel

MINI RIG BOREHOLE RECORD

BH No. **BH6**

Site Location Endon Riding School, Stanley Moss Lane, Endon

Client Name Humphries Builders Limited

Job No. J17032

Date of Drilling 24/04/17 **Grid Ref**

Strata Depth (m)	Sample Depth (m)	Strata Description	Legend	Casing and Test Record	Water/ *Reduced* Levels (m)
0.00		Tarmac over loose grey brown sandy silty gravel with some brick and concrete rubble (MADE GROUND)			
0.55		Firm mottled greenish grey and brown clay (MADE GROUND)			
0.95		Very soft to soft dark grey and brown slightly sandy slightly gravelly clay with some brick fragments and inclusions of silt (MADE GROUND)		SPT N = 1	
1.80		Soft becoming firm at 2.00m mottled greenish grey and brown slightly sandy gravelly CLAY (GLACIAL TILL)		SPT N = 23	
				SPT N = 22	
		…becoming grey with many mudstone fragments at 4.00m		SPT N = 8	
				SPT N = 10	
				SPT N = 19	
5.45					

Key to samples/in situ tests:-

D	Disturbed
B	Bulk
U	Undisturbed
W	Water
SPT	Standard Penetration Test
CPT	Cone Penetration Test
N	N value

Remarks:-

1. No groundwater encountered
2. Slotted 50mm ID HDPE from 0.50m to 5.00m with pea gravel surround. Plain pipe from surface to 0.50m with bentonite seal. Pipe capped with bung and gas tap in stopcock type cover

APPENDIX E

SUMMARY OF SPT 'N' RESULTS

Borehole	Depth (m)	N Value	Blows for 75mm Penetration					
BH1	1.00 - 1.45	11	1	2	1	2	4	4
	2.00 - 2.45	23	3	3	4	5	6	8
	3.00 - 3.45	12	1	2	2	2	3	5
	4.00 - 4.45	13	2	3	3	3	4	3
BH2	1.00 - 1.45	8	2	2	1	2	2	3
	2.00 - 2.45	8	1	1	2	2	2	2
	3.00 - 3.45	12	2	2	3	3	3	3
	4.00 - 4.45	29	4	4	6	7	8	8
	4.45 - 4.83	52 for 225mm	10	11	15	17	20	
BH3	1.00 - 1.45	12	0	0	0	6	3	3
	2.00 - 2.45	11	1	1	2	2	2	5
	3.00 - 3.45	13	2	3	2	3	3	5
	4.00 - 4.45	15	5	3	4	4	3	4
	5.00 - 5.38	54 for 225mm	4	8	16	18	20	
BH4	1.00 - 1.45	18	2	2	2	4	6	6
	2.00 - 2.45	16	2	2	3	5	4	4
	3.00 - 3.45	13	3	3	3	3	4	3
	4.00 - 4.45	48	2	3	5	8	20	15
BH5	1.00 - 1.45	11	2	2	3	3	2	3
	2.00 - 2.45	11	2	2	2	3	3	3
	3.00 - 3.45	7	1	2	1	2	2	2
	4.00 - 4.45	33	3	5	7	7	9	10
BH6	1.00 - 1.45	1	2	1	0	1	0	0
	2.00 - 2.45	23	2	3	4	7	6	6
	3.00 - 3.45	22	5	3	5	5	3	9
	4.00 - 4.45	8	2	2	1	2	2	3
	4.50 - 4.95	10	2	3	2	2	2	4
	5.00 - 5.45	19	3	4	4	5	5	5

APPENDIX F

PID SCREENING RESULTS

Borehole	Depth (m)	PID Reading (ppm)
BH1	0.25	0.0
	0.80	0.0
	1.70	0.0
	2.70	0.0
	3.70	0.0
BH2	0.10	10.6
	0.40	0.0
	1.50	0.0
	2.00	0.0
BH3	0.40	0.0
	1.00 - 1.40	63.5
	1.50 - 2.00	24.3
	2.50 - 2.80	6.8
	3.50 - 3.80	2.4
	4.50 - 5.00	2.3
	5.30 - 5.45	0.4
BH4	0.20	0.0
	1.00	0.2
	3.00	0.0
	4.00	0.0
	4.35	0.0
BH5	0.35	0.0
	1.00	0.0
	1.50	0.0
	2.50	0.0
	3.50	0.0
BH6	0.40	0.0
	1.40	0.0
	1.80	0.0
	2.50 - 3.00	0.0

APPENDIX G

SPILMAN ASSOCIATES

Geotechnical and Environmental Engineers
38 South Avenue
Stourbridge
West Midlands DY8 3XY

Tel: 01384 820578

Gas Monitoring Record Form

Job No: Endon Riding School, Endon (J17032/01)

Date: 24/04/17

Operator: HDS

Weather Conditions: Overcast, light rain

Barometric Pressure Trend (24 hr):

Surface Ground Conditions: Wet

Ambient Air Concentration (% Vol)	**Methane**	**Carbon Dioxide**	**Oxygen**	**Barometric Pressure, Mb**
Before	0.0	0.0	20.5	1006
During				
After	0.0	0.0	20.5	1006

Monitoring Point		**Gas Concentration (%)**							
		Peak			**Steady**				
BH No	Depth to Water (m bgl)	CH_4	CO_2	O_2	CH_4	CO_2	O_2	Gas Emission Rate (l/hr)	Observations/ Comments
BH2	1.96				0.0	0.2	20.0	<0.5	PID 0.0ppm
BH3	1.66				2.6	2.1	11.6	<0.5	PID 13.0ppm
BH4	2.29				0.0	0.5	20.1	<0.5	PID 0.3ppm
BH6	Dry				0.0	3.3	13.2	<0.5	PID 0.0ppm

SPILMAN ASSOCIATES

Geotechnical and Environmental Engineers
38 South Avenue
Stourbridge
West Midlands DY8 3XY

Tel: 01384 820578

Gas Monitoring Record Form

Job No: Endon Riding School, Endon (J17032/01)

Date: 27/04/17

Operator: HDS

Weather Conditions: Sunny/Rain

Barometric Pressure Trend (24 hr):

Surface Ground Conditions: Damp

Ambient Air Concentration (% Vol)	**Methane**	**Carbon Dioxide**	**Oxygen**	**Barometric Pressure, Mb**
Before	0.0	0.0	20.4	998
During				
After	0.0	0.0	20.4	998

Monitoring Point		**Gas Concentration (%)**							
		Peak			**Steady**				
BH No	Depth to Water (m bgl)	CH_4	CO_2	O_2	CH_4	CO_2	O_2	Gas Emission Rate (l/hr)	Observations/ Comments
BH2	0.77				0.0	0.4	20.1	<0.5	PID 0.0ppm
BH3	1.62				3.0	3.4	6.2	<0.5	PID 7.2ppm
BH4	2.28				0.0	3.5	17.0	<0.5	PID 0.0ppm
BH6	3.57				2.1	6.8	8.6	<0.5	PID 0.0ppm

SPILMAN ASSOCIATES

Geotechnical and Environmental Engineers
38 South Avenue
Stourbridge
West Midlands DY8 3XY

Tel: 01384 820578

Gas Monitoring Record Form

Job No: Endon Riding School, Endon (J17032/01)

Date: 02/05/17

Operator: HDS

Weather Conditions: Sunny

Barometric Pressure Trend (24 hr):

Surface Ground Conditions: Damp

Ambient Air Concentration (% Vol)	**Methane**	**Carbon Dioxide**	**Oxygen**	**Barometric Pressure, Mb**
Before	0.0	0.0	20.3	1002
During				
After	0.0	0.0	20.3	1002

Monitoring Point		**Gas Concentration (%)**							
		Peak			**Steady**				
BH No	Depth to Water (m bgl)	CH_4	CO_2	O_2	CH_4	CO_2	O_2	Gas Emission Rate (l/hr)	Observations/ Comments
BH2	0.77				0.0	0.2	20.0	<0.5	PID 0.1ppm
BH3	1.64				0.0	2.1	15.9	<0.5	PID 4.7ppm
BH4	2.28				0.0	3.9	16.8	<0.5	PID 0.5ppm
BH6	3.59				2.5	9.1	3.1	<0.5	PID 0.0ppm

SPILMAN ASSOCIATES

Geotechnical and Environmental Engineers
38 South Avenue
Stourbridge
West Midlands DY8 3XY

Tel: 01384 820578

Gas Monitoring Record Form

Job No: Endon Riding School, Endon (J17032/01)

Date: 05/05/17

Operator: HDS

Weather Conditions: Sunny

Barometric Pressure Trend (24 hr):

Surface Ground Conditions: Dry

Ambient Air Concentration (% Vol)	**Methane**	**Carbon Dioxide**	**Oxygen**	**Barometric Pressure, Mb**
Before	0.0	0.0	20.8	1005
During				
After	0.0	0.0	20.8	1005

Monitoring Point		**Gas Concentration (%)**							
		Peak			**Steady**				
BH No	Depth to Water (m bgl)	CH_4	CO_2	O_2	CH_4	CO_2	O_2	Gas Emission Rate (l/hr)	Observations/ Comments
BH2	0.81				0.0	0.2	19.9	<0.5	PID 0.3ppm
BH3	1.61				4.4	4.3	2.3	<0.5	PID 3.1ppm
BH4	2.30				0.0	3.6	17.3	<0.5	PID 0.4ppm
BH6	3.69				2.1	8.9	1.5	<0.5	PID 0.4ppm

SPILMAN ASSOCIATES

Geotechnical and Environmental Engineers
38 South Avenue
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West Midlands DY8 3XY

Tel: 01384 820578

Gas Monitoring Record Form

Job No: Endon Riding School, Endon (J17032/01)

Date: 15/05/17

Operator: HDS

Weather Conditions: Raining

Barometric Pressure Trend (24 hr):

Surface Ground Conditions: Wet

Ambient Air Concentration (% Vol)	**Methane**	**Carbon Dioxide**	**Oxygen**	**Barometric Pressure, Mb**
Before	0.0	0.0	20.5	999
During				
After	0.0	0.0	20.5	999

Monitoring Point		**Gas Concentration (%)**							
		Peak			**Steady**				
BH No	Depth to Water (m bgl)	CH_4	CO_2	O_2	CH_4	CO_2	O_2	Gas Emission Rate (l/hr)	Observations/ Comments
BH2	0.88				0.0	0.4	20.2	<0.5	PID 0.4ppm
BH3	1.61				0.0	2.2	16.0	<0.5	PID 13.6ppm
BH4	2.34				0.0	4.2	17.6	<0.5	PID 0.2ppm
BH6	3.51				0.0	9.2	2.5	<0.5	PID 0.6ppm

SPILMAN ASSOCIATES

Geotechnical and Environmental Engineers
38 South Avenue
Stourbridge
West Midlands DY8 3XY

Tel: 01384 820578

Gas Monitoring Record Form

Job No: Endon Riding School, Endon (J17032/01)

Date: 19/05/17

Operator: HDS

Weather Conditions: Raining

Barometric Pressure Trend (24 hr):

Surface Ground Conditions: Wet

Ambient Air Concentration (% Vol)	**Methane**	**Carbon Dioxide**	**Oxygen**	**Barometric Pressure, Mb**
Before	0.0	0.0	20.6	1006
During				
After	0.0	0.0	20.6	1006

Monitoring Point		**Gas Concentration (%)**							
		Peak			**Steady**				
BH No	Depth to Water (m bgl)	CH_4	CO_2	O_2	CH_4	CO_2	O_2	Gas Emission Rate (l/hr)	Observations/ Comments
BH2	0.85				0.0	0.3	20.0	<0.5	PID 0.1ppm
BH3	1.62				0.0	2.3	17.1	<0.5	PID 12.1ppm
BH4	2.31				0.0	3.9	16.4	<0.5	PID 0.3ppm
BH6	3.55				0.0	8.7	3.4	<0.5	PID 0.2ppm

APPENDIX H

CONCEPT LIFE SCIENCES
DELIVERING SCIENCE

Concept Life Sciences is a trading name of Scientific Analysis Laboratories registered in England and Wales (No 2514788)

Concept Life Sciences

Certificate of Analysis

Hadfield House
Hadfield Street
Cornbrook
Manchester
M16 9FE
Tel : 0161 874 2400
Fax : 0161 874 2468

Report Number: 649196-1

Date of Report: 04-May-2017

Customer: Spilman Associates
38 South Avenue
Stourbridge. WEST MIDLANDS
DY8 3XY

Customer Contact: Mr Harry Spilman

Customer Job Reference: J17032
Customer Site Reference: Endon Riding School
Date Job Received at Concept: 25-Apr-2017
Date Analysis Started: 26-Apr-2017
Date Analysis Completed: 04-May-2017

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation
This report should not be reproduced except in full without the written approval of the laboratory
Tests covered by this certificate were conducted in accordance with Concept SOPs

UKAS TESTING
1549

mCERTS
THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

Report checked and authorised by :
Sara Abou-Shakra
Project Manager

Issued by :
Sara Abou-Shakra
Project Manager

Concept Reference: 649196
Project Site: Endon Riding School
Customer Reference: J17032

Soil Analysed as Soil
MCERTS Preparation

				Concept Reference	**649196 001**	**649196 002**	**649196 003**	**649196 004**	**649196 005**
				Customer Sample Reference	**BH1**	**BH2**	**BH3**	**BH4**	**BH5**
				Bottom Depth	**0.25**	**0.10**	**0.40**	**0.20**	**0.35**
				Top Depth					
				Date Sampled	**24-APR-2017**	**24-APR-2017**	**24-APR-2017**	**24-APR-2017**	**24-APR-2017**
				Type	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Retained on 10mm sieve	T2	M40	0.1	%	<0.1	<0.1	<0.1	<0.1	<0.1
Moisture @105C	T162	AR	0.1	%	**14**	**7.3**	**22**	**5.2**	**10**
Arsenic	T6	M40	2	mg/kg	**5**	**19**	**11**	**13**	**10**
Boron (water-soluble)	T6	AR	1	mg/kg	<1	<1	<1	<1	<1
Cadmium	T6	M40	1	mg/kg	<1	**1**	<1	<1	<1
Chromium	T6	M40	1	mg/kg	**10**	**23**	**15**	**17**	**15**
Chromium VI	T6	AR	1	mg/kg	<1	<1	<1	<1	<1
Copper	T6	M40	1	mg/kg	**11**	**140**	**22**	**16**	**32**
Lead	T6	M40	1	mg/kg	**44**	**97**	**63**	**53**	**110**
Mercury	T6	M40	1	mg/kg	<1	<1	<1	<1	<1
Nickel	T6	M40	1	mg/kg	**8**	**25**	**12**	**19**	**15**
Selenium	T6	M40	3	mg/kg	<3	<3	<3	<3	<3
Zinc	T6	M40	1	mg/kg	**32**	**170**	**90**	**56**	**100**
Cyanide(free)	T546	AR	1	mg/kg	<1	<1	<1	<1	<1
Phenols(Mono)	T546	AR	1	mg/kg	<1	<1	<1	<1	<1
Cyanide(Complex)	T85	AR	1	mg/kg	<1	<1	<1	<1	<1
Cyanide(Total)	T546	AR	1	mg/kg	<1	<1	<1	<1	<1
SO4(Total)	T6	A40	0.01	%	**0.04**	**0.10**	**0.07**	**0.02**	**0.76**
Sulphur(Free)	T2	AR	500	mg/kg	<500	<500	<500	<500	<500
pH	T7	AR			**8.2**	**8.4**	**7.9**	**7.9**	**8.9**
Sulphide	T4	AR	10	mg/kg	**45**	**35**	**13**	<10	**340**
Asbestos ID	T27	AR			N.D.	Chrysotile Fibres Detected	N.D.	N.D.	N.D.
Naphthalene	T207	M105	0.1	mg/kg	<0.1	**1.1**	<0.1	<0.1	<0.1
Acenaphthylene	T207	M105	0.1	mg/kg	<0.1	(9) <1.0	<0.1	<0.1	<0.1
Acenaphthene	T207	M105	0.1	mg/kg	<0.1	(9) <1.0	<0.1	<0.1	**0.1**
Fluorene	T207	M105	0.1	mg/kg	<0.1	(9) <1.0	<0.1	<0.1	<0.1
Phenanthrene	T207	M105	0.1	mg/kg	<0.1	**3.6**	<0.1	<0.1	**0.8**
Anthracene	T207	M105	0.1	mg/kg	<0.1	(9) <1.0	<0.1	<0.1	**0.2**
Fluoranthene	T207	M105	0.1	mg/kg	**0.3**	**5.8**	**0.2**	<0.1	**1.2**
Pyrene	T207	M105	0.1	mg/kg	**0.3**	**5.1**	**0.2**	<0.1	**1.0**
Benzo(a)Anthracene	T207	M105	0.1	mg/kg	**0.2**	**2.1**	<0.1	<0.1	**0.5**
Chrysene	T207	M105	0.1	mg/kg	**0.2**	**4.1**	<0.1	<0.1	**0.5**
Benzo(b/k)Fluoranthene	T207	M105	0.1	mg/kg	**0.4**	**3.1**	**0.2**	<0.1	**0.9**
Benzo(a)Pyrene	T207	M105	0.1	mg/kg	**0.2**	**1.4**	<0.1	<0.1	**0.5**
Indeno(123-cd)Pyrene	T207	M105	0.1	mg/kg	<0.1	(9) <1.0	<0.1	<0.1	**0.3**
Dibenzo(ah)Anthracene	T207	M105	0.1	mg/kg	<0.1	(9) <1.0	<0.1	<0.1	<0.1
Benzo(ghi)Perylene	T207	M105	0.1	mg/kg	<0.1	(9) <1.0	<0.1	<0.1	**0.3**
PAH(total)	T207	M105	0.1	mg/kg	**1.5**	**26**	**0.5**	<0.1	**6.4**
Benzene	T209	M105	10	µg/kg	(13) <10	(13) <10	(13) <10	(13) <10	(13) <10
Toluene	T209	M105	10	µg/kg	<10	<10	<10	<10	<10
EthylBenzene	T209	M105	10	µg/kg	<10	<10	<10	<10	<10
Methyl tert-Butyl Ether	T209	M105	10	µg/kg	<10	<10	<10	<10	<10
O Xylene	T209	M105	10	µg/kg	<10	**23**	<10	<10	<10
M/P Xylene	T209	M105	10	µg/kg	<10	**16**	<10	<10	<10
TPH (C5-C6 aliphatic)	T209	M105	0.100	mg/kg	<0.100	<0.100	<0.100	<0.100	<0.100
TPH (C6-C8 aliphatic)	T209	M105	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
TPH (C8-C10 aliphatic)	T209	M105	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
TPH (C10-C12 aliphatic)	T206	M105	1	mg/kg	(13) <1	(9,13) <10	(13) <1	(13) <1	(13,9) <10
TPH (C12-C16 aliphatic)	T206	M105	2	mg/kg	(13) <2	(13,9) <10	(13) <2	(13) <2	(13,9) <10
TPH (C16-C21 aliphatic)	T206	M105	1	mg/kg	(13) <1	(9,13) <10	(13) <1	(13) <1	(9,13) <10
TPH (C21-C35 aliphatic)	T206	M105	4	mg/kg	(13) <4	**(13) 36**	(13) <4	(13) <4	(9,13) <10
TPH (C35-C44 aliphatic)	T8	M105	1	mg/kg	(13) <1	(9,13) <10	(13) <1	(13) <1	(9,13) <10
TPH (Aliphatic) total	T85	M105		mg/kg	(13) N.D.	**(13) 36**	(13) N.D.	(13) N.D.	(13) N.D.

Concept Reference: 649196
Project Site: Endon Riding School
Customer Reference: J17032

Soil Analysed as Soil
MCERTS Preparation

				Concept Reference	**649196 001**	**649196 002**	**649196 003**	**649196 004**	**649196 005**
				Customer Sample Reference	**BH1**	**BH2**	**BH3**	**BH4**	**BH5**
				Bottom Depth	**0.25**	**0.10**	**0.40**	**0.20**	**0.35**
				Top Depth					
				Date Sampled	**24-APR-2017**	**24-APR-2017**	**24-APR-2017**	**24-APR-2017**	**24-APR-2017**
				Type	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
TPH (C6-C7 aromatic)	T209	M105	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
TPH (C7-C8 aromatic)	T209	M105	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
TPH (C8-C10 aromatic)	T209	M105	0.10	mg/kg	<0.10	**3.8**	<0.10	<0.10	<0.10
TPH (C10-C12 aromatic)	T206	M105	1	mg/kg	(13) <1	(13,9) <10	(13) <1	(13) <1	(13,9) <10
TPH (C12-C16 aromatic)	T206	M105	1	mg/kg	(13) <1	(13,9) <10	**(13) 2**	(13) <1	(13,9) <10
TPH (C16-C21 aromatic)	T206	M105	1	mg/kg	**(13) 2**	**(13) 38**	**(13) 3**	(13) <1	**(13) 13**
TPH (C21-C35 aromatic)	T206	M105	1	mg/kg	**(13) 6**	**(13) 120**	**(13) 8**	(13) <1	**(13) 46**
TPH (C35-C44 aromatic)	T8	M105	1	mg/kg	(13) <1	(9,13) <10	(13) <1	(13) <1	(9,13) <10
TPH (Aromatic) total	T85	M105		mg/kg	**(13) 8.0**	**(13) 160**	**(13) 13**	(13) N.D.	**(13) 59**
TPH (Aliphatic+Aromatic) (sum)	T85	M105		mg/kg	**(13) 8.0**	**(13) 200**	**(13) 13**	(13) N.D.	**(13) 59**

Concept Reference: 649196
Project Site: Endon Riding School
Customer Reference: J17032

Soil Analysed as Soil
MCERTS Preparation

				Concept Reference	**649196 006**	**649196 007**	**649196 008**	**649196 009**	**649196 010**
				Customer Sample Reference	**BH6**	**BH3**	**BH3**	**BH3**	**BH3**
				Bottom Depth	**0.40**	**01.50**	**2.00**	**2.80**	**4.50**
				Top Depth		**1.0**	**1.50**	**2.50**	
				Date Sampled	**24-APR-2017**	**24-APR-2017**	**24-APR-2017**	**24-APR-2017**	**24-APR-2017**
				Type	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Retained on 10mm sieve	T2	M40	0.1	%	<0.1	<0.1	<0.1	<0.1	<0.1
Moisture @105C	T162	AR	0.1	%	**15**	**14**	**8.3**	**12**	**18**
Arsenic	T6	M40	2	mg/kg	**13**	-	-	-	-
Boron (water-soluble)	T6	AR	1	mg/kg	<1	-	-	-	-
Cadmium	T6	M40	1	mg/kg	**2**	-	-	-	-
Chromium	T6	M40	1	mg/kg	**18**	-	-	-	-
Chromium VI	T6	AR	1	mg/kg	<1	-	-	-	-
Copper	T6	M40	1	mg/kg	**37**	-	-	-	-
Lead	T6	M40	1	mg/kg	**480**	-	-	-	-
Mercury	T6	M40	1	mg/kg	**1**	-	-	-	-
Nickel	T6	M40	1	mg/kg	**20**	-	-	-	-
Selenium	T6	M40	3	mg/kg	<3	-	-	-	-
Zinc	T6	M40	1	mg/kg	**180**	-	-	-	-
Cyanide(free)	T546	AR	1	mg/kg	<1	-	-	-	-
Phenols(Mono)	T546	AR	1	mg/kg	<1	-	-	-	-
Cyanide(Complex)	T85	AR	1	mg/kg	<1	-	-	-	-
Cyanide(Total)	T546	AR	1	mg/kg	<1	-	-	-	-
SO4(Total)	T6	A40	0.01	%	**0.26**	-	-	-	-
Sulphur(Free)	T2	AR	500	mg/kg	<500	-	-	-	-
pH	T7	AR			**9.3**	-	-	-	-
Sulphide	T4	AR	10	mg/kg	**230**	-	-	-	-
Asbestos ID	T27	AR			N.D.	-	-	-	-
Naphthalene	T207	M105	0.1	mg/kg	<0.1	-	-	-	-
Acenaphthylene	T207	M105	0.1	mg/kg	<0.1	-	-	-	-
Acenaphthene	T207	M105	0.1	mg/kg	<0.1	-	-	-	-
Fluorene	T207	M105	0.1	mg/kg	<0.1	-	-	-	-
Phenanthrene	T207	M105	0.1	mg/kg	**0.4**	-	-	-	-
Anthracene	T207	M105	0.1	mg/kg	**0.1**	-	-	-	-
Fluoranthene	T207	M105	0.1	mg/kg	**0.6**	-	-	-	-
Pyrene	T207	M105	0.1	mg/kg	**0.6**	-	-	-	-
Benzo(a)Anthracene	T207	M105	0.1	mg/kg	**0.4**	-	-	-	-
Chrysene	T207	M105	0.1	mg/kg	**0.4**	-	-	-	-
Benzo(b/k)Fluoranthene	T207	M105	0.1	mg/kg	**0.8**	-	-	-	-
Benzo(a)Pyrene	T207	M105	0.1	mg/kg	**0.4**	-	-	-	-
Indeno(123-cd)Pyrene	T207	M105	0.1	mg/kg	**0.2**	-	-	-	-
Dibenzo(ah)Anthracene	T207	M105	0.1	mg/kg	<0.1	-	-	-	-
Benzo(ghi)Perylene	T207	M105	0.1	mg/kg	**0.3**	-	-	-	-
PAH(total)	T207	M105	0.1	mg/kg	**4.3**	-	-	-	-
Benzene	T209	M105	10	µg/kg	(13) <10	(13) <10	(13) <10	(13) <10	(13) <10
Toluene	T209	M105	10	µg/kg	<10	<10	<10	<10	<10
EthylBenzene	T209	M105	10	µg/kg	<10	<10	<10	**33**	**27**
Methyl tert-Butyl Ether	T209	M105	10	µg/kg	<10	<10	<10	<10	<10
O Xylene	T209	M105	10	µg/kg	<10	<10	<10	<10	<10
M/P Xylene	T209	M105	10	µg/kg	<10	<10	<10	**16**	**14**
TPH (C5-C6 aliphatic)	T209	M105	0.100	mg/kg	<0.100	<0.100	<0.100	<0.100	<0.100
TPH (C6-C8 aliphatic)	T209	M105	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
TPH (C8-C10 aliphatic)	T209	M105	0.10	mg/kg	<0.10	**16**	**3.7**	<0.10	<0.10
TPH (C10-C12 aliphatic)	T206	M105	1	mg/kg	(9,13) <10	**(13) 210**	**(13) 21**	**(13) 1**	**(13) 2**
TPH (C12-C16 aliphatic)	T206	M105	2	mg/kg	(9,13) <10	**(13) 740**	**(13) 90**	**(13) 7**	**(13) 7**
TPH (C16-C21 aliphatic)	T206	M105	1	mg/kg	(9,13) <10	**(13) 420**	**(13) 66**	**(13) 3**	**(13) 3**
TPH (C21-C35 aliphatic)	T206	M105	4	mg/kg	(9,13) <10	**(13) 220**	**(13) 29**	(13) <4	(13) <4
TPH (C35-C44 aliphatic)	T8	M105	1	mg/kg	(13,9) <10	(100,13) <10	(13) <1	(13) <1	(13) <1
TPH (Aliphatic) total	T85	M105		mg/kg	(13) N.D.	**(13) 1600**	**(13) 210**	**(13) 11**	**(13) 12**
TPH (C6-C7 aromatic)	T209	M105	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10

Concept Reference: 649196
Project Site: Endon Riding School
Customer Reference: J17032

Soil Analysed as Soil
MCERTS Preparation

	Concept Reference	649196 006	649196 007	649196 008	649196 009	649196 010
	Customer Sample Reference	BH6	BH3	BH3	BH3	BH3
	Bottom Depth	0.40	01.50	2.00	2.80	4.50
	Top Depth		1.0	1.50	2.50	
	Date Sampled	24-APR-2017	24-APR-2017	24-APR-2017	24-APR-2017	24-APR-2017
	Type	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil
Determinand	**Method** / **Test Sample** / **LOD** / **Units**					
TPH (C7-C8 aromatic)	T209 M105 0.10 mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
TPH (C8-C10 aromatic)	T209 M105 0.10 mg/kg	<0.10	**2.0**	**0.24**	<0.10	<0.10
TPH (C10-C12 aromatic)	T206 M105 1 mg/kg	(13,9) <10	**(13) 96**	**(13) 6**	(13) <1	(13) <1
TPH (C12-C16 aromatic)	T206 M105 1 mg/kg	(13,9) <10	**(13) 190**	**(13) 14**	(13) <1	(13) <1
TPH (C16-C21 aromatic)	T206 M105 1 mg/kg	(9,13) <10	**(13) 140**	**(13) 6**	(13) <1	(13) <1
TPH (C21-C35 aromatic)	T206 M105 1 mg/kg	(13,9) <10	(13,100) <10	(13) <1	(13) <1	(13) <1
TPH (C35-C44 aromatic)	T8 M105 1 mg/kg	(9,13) <10	(100,13) <10	(13) <1	(13) <1	(13) <1
TPH (Aromatic) total	T85 M105 mg/kg	(13) N.D.	**(13) 430**	**(13) 26**	(13) N.D.	(13) N.D.
TPH (Aliphatic+Aromatic) (sum)	T85 M105 mg/kg	(13) N.D.	**(13) 2000**	**(13) 240**	**(13) 11**	**(13) 12**

Index to symbols used in 649196-1

Value	Description
M40	Analysis conducted on sample assisted dried at no more than 40C. Results are reported on a dry weight basis.
M105	Analysis conducted on an "as received" aliquot. Results are reported on a dry weight basis where moisture content was determined by assisted drying of sample at 105C
A40	Assisted dried < 40C
AR	As Received
N.D.	Not Detected
100	LOD determined by sample aliquot used for analysis
9	LOD raised due to dilution of sample
13	Results have been blank corrected.
S	Analysis was subcontracted
M	Analysis is MCERTS accredited
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Notes

Asbestos subcontracted to REC Asbestos
Report A to report soil samples only

Method Index

Value	Description
T2	Grav
T206	GC/FID (MCERTS)
T4	Colorimetry
T7	Probe
T85	Calc
T209	GC/MS (Head Space)(MCERTS)
T27	PLM
T6	ICP/OES
T8	GC/FID
T162	Grav (1 Dec) (105 C)
T207	GC/MS (MCERTS)
T546	Colorimetry (CF)

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Retained on 10mm sieve	T2	M40	0.1	%	N	001-010
Moisture @105C	T162	AR	0.1	%	N	001-010
Arsenic	T6	M40	2	mg/kg	M	001-006
Boron (water-soluble)	T6	AR	1	mg/kg	N	001-006
Cadmium	T6	M40	1	mg/kg	M	001-006
Chromium	T6	M40	1	mg/kg	M	001-006
Chromium VI	T6	AR	1	mg/kg	N	001-006
Copper	T6	M40	1	mg/kg	M	001-006
Lead	T6	M40	1	mg/kg	M	001-006
Mercury	T6	M40	1	mg/kg	M	001-006
Nickel	T6	M40	1	mg/kg	M	001-006
Selenium	T6	M40	3	mg/kg	M	001-006
Zinc	T6	M40	1	mg/kg	M	001-006
Cyanide(free)	T546	AR	1	mg/kg	M	001-006
Phenols(Mono)	T546	AR	1	mg/kg	M	001-006
Cyanide(Complex)	T85	AR	1	mg/kg	N	001-006
Cyanide(Total)	T546	AR	1	mg/kg	M	001-006
SO4(Total)	T6	A40	0.01	%	N	001-006
Sulphur(Free)	T2	AR	500	mg/kg	N	001-006
pH	T7	AR			M	001-006
Sulphide	T4	AR	10	mg/kg	N	001-006
Asbestos ID	T27	AR			SU	001-006
Naphthalene	T207	M105	0.1	mg/kg	M	001-006
Acenaphthylene	T207	M105	0.1	mg/kg	U	001-006
Acenaphthene	T207	M105	0.1	mg/kg	M	001-006
Fluorene	T207	M105	0.1	mg/kg	M	001-006
Phenanthrene	T207	M105	0.1	mg/kg	M	001-006
Anthracene	T207	M105	0.1	mg/kg	U	001-006
Fluoranthene	T207	M105	0.1	mg/kg	M	001-006
Pyrene	T207	M105	0.1	mg/kg	M	001-006
Benzo(a)Anthracene	T207	M105	0.1	mg/kg	M	001-006
Chrysene	T207	M105	0.1	mg/kg	M	001-006
Benzo(b/k)Fluoranthene	T207	M105	0.1	mg/kg	M	001-006
Benzo(a)Pyrene	T207	M105	0.1	mg/kg	M	001-006
Indeno(123-cd)Pyrene	T207	M105	0.1	mg/kg	M	001-006
Dibenzo(ah)Anthracene	T207	M105	0.1	mg/kg	M	001-006
Benzo(ghi)Perylene	T207	M105	0.1	mg/kg	M	001-006
PAH(total)	T207	M105	0.1	mg/kg	U	001-006
Benzene	T209	M105	10	µg/kg	M	001-010
Toluene	T209	M105	10	µg/kg	M	001-010
EthylBenzene	T209	M105	10	µg/kg	M	001-010
Methyl tert-Butyl Ether	T209	M105	10	µg/kg	M	001-010
O Xylene	T209	M105	10	µg/kg	M	001-010
M/P Xylene	T209	M105	10	µg/kg	M	001-010
TPH (C5-C6 aliphatic)	T209	M105	0.100	mg/kg	N	001-010
TPH (C6-C8 aliphatic)	T209	M105	0.10	mg/kg	N	001-010
TPH (C8-C10 aliphatic)	T209	M105	0.10	mg/kg	N	001-010
TPH (C10-C12 aliphatic)	T206	M105	1	mg/kg	N	001-010
TPH (C12-C16 aliphatic)	T206	M105	2	mg/kg	M	001-010
TPH (C16-C21 aliphatic)	T206	M105	1	mg/kg	M	001-010
TPH (C21-C35 aliphatic)	T206	M105	4	mg/kg	M	001-010
TPH (C35-C44 aliphatic)	T8	M105	1	mg/kg	N	001-010
TPH (Aliphatic) total	T85	M105		mg/kg	N	001-010
TPH (C6-C7 aromatic)	T209	M105	0.10	mg/kg	N	001-010
TPH (C7-C8 aromatic)	T209	M105	0.10	mg/kg	N	001-010
TPH (C8-C10 aromatic)	T209	M105	0.10	mg/kg	N	001-010
TPH (C10-C12 aromatic)	T206	M105	1	mg/kg	M	001-010
TPH (C12-C16 aromatic)	T206	M105	1	mg/kg	M	001-010
TPH (C16-C21 aromatic)	T206	M105	1	mg/kg	M	001-010
TPH (C21-C35 aromatic)	T206	M105	1	mg/kg	M	001-010
TPH (C35-C44 aromatic)	T8	M105	1	mg/kg	N	001-010
TPH (Aromatic) total	T85	M105		mg/kg	N	001-010
TPH (Aliphatic+Aromatic) (sum)	T85	M105		mg/kg	N	001-010

CONCEPT LIFE SCIENCES
DELIVERING SCIENCE

Concept Life Sciences is a trading name of Scientific Analysis Laboratories registered in England and Wales (No 2514788)

Concept Life Sciences

Certificate of Analysis

Hadfield House
Hadfield Street
Cornbrook
Manchester
M16 9FE
Tel : 0161 874 2400
Fax : 0161 874 2468

Report Number: 651255-1

Date of Report: 10-May-2017

Customer: Spilman Associates
38 South Avenue
Stourbridge. WEST MIDLANDS
DY8 3XY

Customer Contact: Mr Harry Spilman

Customer Job Reference: J17032
Customer Site Reference: Endon Riding School
Date Job Received at Concept: 25-Apr-2017
Date Analysis Started: 05-May-2017
Date Analysis Completed: 10-May-2017

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.

Tests covered by this certificate were conducted in accordance with Concept SOPs

Report checked
and authorised by :
Sara Abou-Shakra
Project Manager

Issued by :
Sara Abou-Shakra
Project Manager

Concept Reference:	651255
Project Site:	Endon Riding School
Customer Reference:	J17032

Soil Analysed as Soil

Miscellaneous

Concept Reference	**651255 001**
Customer Sample Reference	**BH2 (649196/002)**
Date Sampled	**24-APR-2017**

Determinand	Method	Test Sample	LOD	Units	
Asbestos Quantification	T27	AR	0.001	%	Chrysotile Fibres Detected **0.002**

Index to symbols used in 651255-1

Value	Description
AR	As Received
S	Analysis was subcontracted
U	Analysis is UKAS accredited

Notes

Asbestos subcontracted to REC Asbestos

Method Index

Value	Description
T27	PLM

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Asbestos Quantification	T27	AR	0.001	%	SU	001

APPENDIX I

CONCEPT LIFE SCIENCES
DELIVERING SCIENCE

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Concept Life Sciences

Certificate of Analysis

Hadfield House
Hadfield Street
Cornbrook
Manchester
M16 9FE
Tel : 0161 874 2400
Fax : 0161 874 2468

Report Number: 651697-1

Date of Report: 12-May-2017

Customer: Spilman Associates
38 South Avenue
Stourbridge. WEST MIDLANDS
DY8 3XY

Customer Contact: Mr Harry Spilman

Customer Job Reference: J17032
Customer Site Reference: Endon Riding School
Date Job Received at Concept: 05-May-2017
Date Analysis Started: 08-May-2017
Date Analysis Completed: 11-May-2017

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation
This report should not be reproduced except in full without the written approval of the laboratory
Tests covered by this certificate were conducted in accordance with Concept SOPs

UKAS TESTING
1549

Report checked and authorised by :
Sara Abou-Shakra
Project Manager

Issued by :
Sara Abou-Shakra
Project Manager

Concept Reference: 651697
Project Site: Endon Riding School
Customer Reference: J17032

Water Analysed as Water
TPH UKCWG

				Concept Reference	**651697 001**	**651697 002**	**651697 003**
				Customer Sample Reference	**BH3**	**BH4**	**SW1**
				Date Sampled	**04-MAY-2017**	**04-MAY-2017**	**04-MAY-2017**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**			
Benzene	T54	AR	1	µg/l	(13) <1	(13) <1	(13) <1
EthylBenzene	T54	AR	1	µg/l	<1	<1	<1
M/P Xylene	T54	AR	1	µg/l	<1	<1	<1
Methyl tert-Butyl Ether	T54	AR	1	µg/l	<1	<1	<1
O Xylene	T54	AR	1	µg/l	<1	<1	<1
Toluene	T54	AR	1	µg/l	<1	<1	<1
TPH (C5-C6 aliphatic)	T215	AR	0.010	mg/l	<0.010	<0.010	<0.010
TPH (C6-C8 aliphatic)	T215	AR	0.010	mg/l	<0.010	<0.010	<0.010
TPH (C8-C10 aliphatic)	T215	AR	0.010	mg/l	<0.010	<0.010	<0.010
TPH DW(C10-C12 aliphatic)	T81	AR	0.01	mg/l	(13) <0.01	(13) <0.01	(13) <0.01
TPH DW(C12-C16 aliphatic)	T81	AR	0.01	mg/l	**(13) 0.03**	(13) <0.01	**(13) 0.10**
TPH DW(C16-C21 aliphatic)	T81	AR	0.01	mg/l	(13) <0.01	(13) <0.01	**(13) 0.06**
TPH DW(C21-C35 aliphatic)	T81	AR	0.01	mg/l	(13) <0.01	(13) <0.01	(13) <0.01
TPH (C35-C44 aliphatic)	T81	AR	0.01	mg/l	(13) <0.01	(13) <0.01	(13) <0.01
TPH (Aliphatic) total	T85	AR		mg/l	**(13) 0.03**	(13) N.D.	**(13) 0.16**
TPH (C6-C7 aromatic)	T215	AR	0.010	mg/l	<0.010	<0.010	<0.010
TPH (C7-C8 aromatic)	T215	AR	0.010	mg/l	<0.010	<0.010	<0.010
TPH (C8-C10 aromatic)	T215	AR	0.010	mg/l	<0.010	<0.010	<0.010
TPH DW(C10-C12 aromatic)	T81	AR	0.01	mg/l	(13) <0.01	(13) <0.01	(13) <0.01
TPH DW(C12-C16 aromatic)	T81	AR	0.01	mg/l	(13) <0.01	(13) <0.01	(13) <0.01
TPH DW(C16-C21 aromatic)	T81	AR	0.01	mg/l	(13) <0.01	(13) <0.01	(13) <0.01
TPH DW(C21-C35 aromatic)	T81	AR	0.01	mg/l	(13) <0.01	(13) <0.01	(13) <0.01
TPH (C35-C44 aromatic)	T81	AR	0.01	mg/l	(13) <0.01	(13) <0.01	(13) <0.01
TPH (Aromatic) total	T85	AR		mg/l	(13) N.D.	(13) N.D.	(13) N.D.
TPH (Aliphatic+Aromatic) (sum)	T85	AR		mg/l	**(13) 0.03**	(13) N.D.	**(13) 0.16**
Total Petroleum Hydrocarbons (C5 - C10 aliphatic/aromatic)	T85	AR	0.010	mg/l	<0.010	<0.010	<0.010

Index to symbols used in 651697-1

Value	Description
AR	As Received
N.D.	Not Detected
13	Results have been blank corrected.
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Method Index

Value	Description
T54	GC/MS (Headspace)
T81	GC/FID (LV)
T215	GC/MS (Headspace)(LV)
T85	Calc

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Benzene	T54	AR	1	µg/l	U	001-003
EthylBenzene	T54	AR	1	µg/l	U	001-003
M/P Xylene	T54	AR	1	µg/l	U	001-003
Methyl tert-Butyl Ether	T54	AR	1	µg/l	U	001-003
O Xylene	T54	AR	1	µg/l	U	001-003
Toluene	T54	AR	1	µg/l	U	001-003
TPH (C5-C6 aliphatic)	T215	AR	0.010	mg/l	N	001-003
TPH (C6-C8 aliphatic)	T215	AR	0.010	mg/l	N	001-003

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
TPH (C8-C10 aliphatic)	T215	AR	0.010	mg/l	N	001-003
TPH DW(C10-C12 aliphatic)	T81	AR	0.01	mg/l	N	001-003
TPH DW(C12-C16 aliphatic)	T81	AR	0.01	mg/l	N	001-003
TPH DW(C16-C21 aliphatic)	T81	AR	0.01	mg/l	N	001-003
TPH DW(C21-C35 aliphatic)	T81	AR	0.01	mg/l	N	001-003
TPH (C35-C44 aliphatic)	T81	AR	0.01	mg/l	N	001-003
TPH (Aliphatic) total	T85	AR		mg/l	N	001-003
TPH (C6-C7 aromatic)	T215	AR	0.010	mg/l	N	001-003
TPH (C7-C8 aromatic)	T215	AR	0.010	mg/l	N	001-003
TPH (C8-C10 aromatic)	T215	AR	0.010	mg/l	N	001-003
TPH DW(C10-C12 aromatic)	T81	AR	0.01	mg/l	N	001-003
TPH DW(C12-C16 aromatic)	T81	AR	0.01	mg/l	N	001-003
TPH DW(C16-C21 aromatic)	T81	AR	0.01	mg/l	N	001-003
TPH DW(C21-C35 aromatic)	T81	AR	0.01	mg/l	N	001-003
TPH (C35-C44 aromatic)	T81	AR	0.01	mg/l	N	001-003
TPH (Aromatic) total	T85	AR		mg/l	N	001-003
TPH (Aliphatic+Aromatic) (sum)	T85	AR		mg/l	N	001-003
Total Petroleum Hydrocarbons (C5 - C10 aliphatic/aromatic)	T85	AR	0.010	mg/l	N	001-003

APPENDIX J

LABORATORY REPORT FOR INDEX PROPERTY AND CHEMICAL TESTING

Contract: Endon Riding School.
J17032

Customer: Spilman Associates,
38 South Avenue,
Stourbridge,
West Midlands,
DY8 3XY.

GIP
Devonshire House, Ettingshall Road,
Wolverhampton. WV2 2JT
Phone 01902 459558, Fax 01902 459085, Email lab@gipuk.com

Job No:- L/9055 | Page No:- 1 of 1
Date Received:- 27.04.17 | Date Issued:- 11.05.17

SAMPLE DETAILS			TEST DATE	Index Properties					CHEMICAL					% PASSING BS SIEVE SIZE		SAMPLE DESCRIPTION	COMMENTS
SAMPLE No.	DEPTH m	SAMPLE TYPE		W %	W_L %	W_P %	I_P %	PD (Gas Jar) Mg/m^3	*Total SO_4 %	Soluble SO_4 g/L	pH Value	*L.O.I. %	*ORG %	2.00 mm	0.425 mm		
BH1	0.80	D	27.04.17	28	38	17	21			0.08	6.7			89	91	Firm light brown grey slightly sandy slightly gravelly CLAY.	
BH3	2.50-2.80	D	27.04.17	12	33	16	17								74	Firm grey slightly sandy gravelly CLAY.	
BH4	1.00	D	09.05.17							0.08	6.8			90		Light brown slightly silty SAND.	
BH5	1.00	D	09.05.17							0.26	8.7			38		MADE GROUND: Dark grey brown clayey sandy GRAVEL.	#
BH6	1.40	D	09.05.17							0.14	6.8			81		MADE GROUND: Soft dark grey slightly sandy slightly gravelly CLAY.	
BH6	1.80	D	27.04.17	# 22	32	15	17			# 0.07	# 6.3			# 75	70	Firm brown slightly sandy slightly gravelly CLAY.	

Sample type		Test abbreviations		Test methods - Unless otherwise stated.	
D	Disturbed	W	Moisture Content	W%	BS1377:Part 2:1990:3.2
B	Bulk disturbed	W_L	Liquid limit	W_L	BS1377:Part 2:1990:4.4
U	Undisturbed	W_P	Plastic limit	W_P	BS1377:Part 2:1990:5.3
S	SPT split spoon	I_P	Index property	I_P	BS1377:Part 2:1990:5.4
W	Ground water	PD	Particle Density	PD	BS1377:Part 3:1990:8.2
T	Tub	L.O.I	Loss on ignition	L.O.I	BS1377:Part 3:1990:4
		ORG	Organic content	ORG	BS1377:Part 3:1990:3

Total SO_4	BS1377:Part 3:1990:5.5
Sol SO_4	BS1377:Part 3:1990:5.5
pH Value	BS1377:Part 3:1990:9

Approved signatory:-

Paul Smart, Laboratory Manager.....

1897

Tests marked * are not UKAS accredited.

The reported results relate only to samples received.

 # = Sample mass smaller than BS1377 requirements.

Opinions and interpretations are outside the scope of UKAS accreditation

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