Phase 2 (Supplementary) Report

Mendle Farm, Holme

Produced for Flynn Architecture c/o Mr J W Richardson

September 2020

Humberside Materials Laboratory Ltd
Atherton Way, Brigg
North Lincolnshire DN21 4DT
Tel 01652 652753

www.humbersidematerialslab.co.uk

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0.0	Document for issue	D Driver *Director*	R Lester *Geo-Env Engineer*	March 2020
1.0	Additional plan and sample locations	D Driver *Director*	M Driver *Director*	August 2020
2.0	Update to GAC limit (Chromium) and hand pit location plan	D Driver *Director*	R Lester *Geo-Env Engineer*	September 2020

Ground investigation report

Contents

EXECUTIVE SUMMARY

<table>
<tr><td>Proposed works</td><td colspan="4">It is proposed to develop the site with the construction of a new agricultural workers residential home with associated garden areas.</td></tr>
<tr><td>Site history</td><td colspan="4">Land associated with farming since earliest mapping (1886). No structures present until 1966, structures typical to existing plan and possibly re-worked in the 1980's.</td></tr>
<tr><td>Site geology</td><td colspan="4">Limited made ground (max depth 0.32m bgl) onto Sutton sand formation proven to circa 2.5m bgl.</td></tr>
<tr><td>Additional Site works</td><td colspan="4">4 no. hand pits to circa 1m bgl.</td></tr>
<tr><td>Ground conditions</td><td colspan="4"><table>
<tr><td>Topsoil</td><td>HP1 & HP2</td><td>Dark brown fine SANDY TOPSOIL</td><td>0.3-0.4</td></tr>
<tr><td>Made Ground</td><td>WS2, WS4, HP2 & HP4</td><td>Gravel with dark brown silty sand or dark brown gravelly silty sand including ash and brick. HP4 included fragments of concrete, brick and chalk</td><td>0.2-0.32</td></tr>
<tr><td rowspan="3">Sutton Sand Formation</td><td>HP3</td><td>Dense dark brown silty fine SAND</td><td>0.6</td></tr>
<tr><td>HP1, HP2 & HP3</td><td>Dense yellow brown fine to medium sand</td><td>0.8-1.0</td></tr>
<tr><td>WS2, WS4, HP1 & HP4</td><td>Dense orange brown slightly silty sand</td><td>1.0-2.5</td></tr>
</table></td></tr>
<tr><td>Contamination test results</td><td colspan="4">HP3 identified low level PAH contamination within the made ground below the existing structure. None of the remaining four samples identified any elevated levels of metals or PAHs. No asbestos was identified in any of the five samples analysed.</td></tr>
<tr><td>Revised risk assessment</td><td colspan="4">A source has been identified within the existing made ground with potential risk to the end user.</td></tr>
<tr><td>Mitigation measures</td><td colspan="4">The health risk to construction workers should be mitigated by suitable safe working practices. Buried concrete should be to BRE Special Digest 1 and water pipework should meet local water authority requirements</td></tr>
<tr><td>Contamination remediation</td><td colspan="4">Removal of all made ground within proposed garden areas.</td></tr>
</table>

1 Introduction

Humberside Materials Laboratory Limited (HML) has undertaken a geo-environmental ground investigation for a proposed new agricultural workers residential property on land at Mendle Farm, Holme, as requested by the client, Mr J W Richardson. The land will be hereinafter referred to as *the site*.

1.1 Aims

The aim of the investigation is to assess relevant geo-environmental aspects of the site in relation to proposed development works. This includes an evaluation of encountered ground conditions and contamination issues. This report is a supplementary report to Michael D Joyce Associates LLP phase 1 and phase 2 report (No. 3666) to address issues raised within North Lincolnshire Councils memo ref 004375 dated 16th July 2019 in conjunction with planning application PA/2019/547.

1.2 Scope

The scope of the investigation includes:

- Additional intrusive investigation with soil sampling
- Geochemical laboratory testing
- A contamination conceptual site model and risk assessment
- Options for remediation or further works, if required

1.3 Conditions and Limitations

This report is produced solely for the client and should only be copied in full. When transmitted electronically, the definitive copy of the report is held by Humberside Materials Laboratory Ltd.

This report is prepared on the assumption that all facts have been disclosed.

The comments given in this report and the opinions expressed assume that conditions do not vary beyond the range revealed by this study and the information provided in the production of this report is complete and reliable.

2 Review of desk study and original phase 2

2.1 Desk study

A phase 1 desk study has been undertaken by Michael D Joyce Associates LLP (report No. 3666) which did not identify any source risks above GAC guidelines which suggested no further investigation is required based on a pragmatic approach. This report also included a site investigation which contains two number contamination suites as discussed within section 2.2.

The sites known history is associated with farming from as early as 1886. The existing site structures may have been present from 1966 and potentially re-worked in the 1980's.

2.2 Original phase 2 site investigation

The original site investigation included four borehole locations with relevant sampling and strength testing. Encountered ground conditions along with structural recommendations can be found in the original report.

Two shallow made ground samples from WS2 and WS4 were analysed for Metals, PAH and asbestos identification. No elevated levels were reported to be above current guideline values.

2.3 Proposed development

It is proposed to develop the site with the construction of a new agricultural workers residential dwelling.

The proposed layout is included in Appendix A.

3 Supplementary Site Investigation Works

The procedures adopted for this site investigation are based on BS 5930 (2015) – Code of Practice for Site Investigations and BS 10175 (2011 + A2, 2017). The soils and rocks encountered have been described based on BS5930 (2015), BS EN ISO 14688-1 (2002) and BS EN ISO 14689-1 (2003).

3.1 Fieldwork

Fieldwork took place on the 14th February 2020.

Approximate locations of the site works are shown in the exploratory hole location plan which is presented later (in Appendix A).

The positions of the exploratory holes were established relative to existing site features and using GPS locating equipment. The depths to sub-strata and groundwater were measured from ground level.

3.1.1 Exploratory holes

Four number hand pits (HP1 to HP4) were excavated around the existing structures. Two number sample holes were through the existing structures concrete floor slabs and two number within the green area to the west of the existing structures. The maximum depth of sampling was 1.0m bgl.

Logs for the hand pits are presented later an are titled trial pit 1 (HP1) to trial pit 4 (HP4) in Appendix B.

The hand pits and previous windowless sampler holes have been located in the most onerous positions in relation to the proposed development. WS1 to WS3 and HP1 to HP2 have been located within proposed soft landscaped areas. HP2 and HP4 were located below existing structures and WS4 is located within the proposed drive/garden path area. An approximate plan within appendix A shows the proposed plot and sample locations.

3.2 Laboratory testing

Geochemical testing was undertaken by Chemtech, a UKAS and MCERTS accredited laboratory. The scope of geochemical testing comprised the following.

- 5 number tests for a suite of metals
- 5 number tests for a suite of speciated PAHs
- 5 number asbestos identification tests

A schedule of testing is shown below (in Table 1). Results for all the laboratory testing undertaken are included later in this report (in Appendix C).

Table 1: Schedule of laboratory testing							
Sample hole	*Sample location*	*HML Sample ref. (S/__)*	*Chemtech sample ref.*	*Depth (m bgl)*	*Metals*	*Speciated PAHs*	*Asbestos*
HP1	HP1-1	S/55319	84556-1	0.1-0.5	**ü**	**ü**	**ü**
HP2	HP2-1	S/55320	84556-2	0.1-0.5	**ü**	**ü**	**ü**
HP3	HP3-1	S/55321	84556-3	0.05-0.3	**ü**	**ü**	**ü**
	HP3-2	S/55322	84556-4	0.5-1.0	**ü**	**ü**	**ü**
HP4	HP4-1	S/55323	84556-5	0.05-0.32	**ü**	**ü**	**ü**

4 Ground Conditions

4.1 Sequence of sub-strata

The sub-strata as revealed during the site works is summarised below (in Table 2). Copies of the borehole logs are presented later (in Appendix B).

Table 2: Summary of revealed ground conditions (during site works)

Strata	*Location*	*Summary description*	*Depth to base of stratum (m bgl)*
Topsoil	HP1 & HP2	Dark brown fine SANDY TOPSOIL	0.3-0.4
Made Ground	WS2, WS4, HP2 & HP4	Gravel with dark brown silty sand or dark brown gravelly silty sand including ash and brick. HP4 included fragments of concrete, brick and chalk	0.2-0.32
Sutton Sand Formation	HP3	Dense dark brown silty fine SAND	0.6
	HP1, HP2 & HP3	Dense yellow brown fine to medium sand	0.8-1.0
	WS2, WS4, HP1 & HP4	Dense orange brown slightly silty sand	1.0-2.5

The revealed ground conditions were generally as anticipated. Some made ground was revealed in WS2, WS4, HP3 and HP4 as expected. Natural soils comprised Sutton sand formation as inferred from local BGS mapping.

4.2 Topsoil

HP1 and HP2 within the green section to the west of the existing structures noted 0.3m to 0.4m thick layer of topsoil. None of the remaining hand pits or window sampler holes reveal any topsoil as anticipated.

4.3 Made ground

Made ground was found in four of the six logged locations. It was found to reach depths of between 0.2m (WS2&4) and 0.32m (HP4) bgl.

The made ground was found to mainly comprise of natural soils of sands and gravels with small amounts of ash, brick, concrete or chalk noted. Little visual or olfactory evidence of contamination was noted within the made ground, no unusual odours, stains or discolouration were recorded. Nevertheless, the construction waste material could contain contaminants such as metals, PAHs and asbestos.

4.4 Sutton sand formation

Sutton sand formation was recorded below the made ground and topsoil. The sands were found to reach a depth of at least 2.5m bgl. The sands consisted of relatively dense fine to medium sands, slightly silty in paces with a variation in colours.

4.5 Charmouth Mudstone

Charmouth Mudstone was not reached by the exploratory holes. This bedrock is anticipated to be around 8m bgl and maybe weathered in the first instance.

4.5 Groundwater observations

The original investigation (September) noted a water strike at 2.1m bgl in WS2 with no strike monitored within WS4 which was terminated at 2.5m bgl. The additional hand pits noted slight seepages between 0.8m and 1.0m bgl with HP1 and HP2 within the soil area, no seepages were noted within HP3 or HP4 below the concrete slabs which were terminated at1.0m bgl.

5 Contamination test results

The results of all geochemical testing are presented later (in Appendix C).

Assessment criteria (in mg/kg) have been taken from the *generic assessment criteria* (GAC) published in the *Land Quality Management Ltd/Chartered Institute of Environmental Health suitable for use levels* (LQM/CIEH S4ULs) report (LQM/CIEH, 2015). The exception to this is the GAC for lead which is taken from the Category 4 Screening Level (C4SL) data published in a report by Defra (2014). All the GAC are based on the context of a *commercial* development.

5.1 Metals and metalloids

Table 3 (below) gives the GAC for metal (and metalloid) contaminants considered for the site.

Table 3: Generic assessment criteria for metals – Residential with plant uptake

Element	*Residential with plant uptake* (mg/kg)*
Arsenic	37
Boron	290
Cadmium	11
Chromium III	910
Chromium VI	6
Copper	2400
Lead**	200
Mercury element	1.2
Mercury inorganic	40
Mercury methyl	11
Nickel	130
Selenium	250
Vanadium	410
Zinc	3700
* from LQM/CIEH (2015) except: ** from Defra (2014)	

Five samples, two samples from within the current green area (HP1, 0.1m-0.5m & HP2, 0.1m-0.5m), two samples from below concrete slabs (HP3, 0.05m-0.3m & HP4, 0.05m-0.32m) and one sample of expected natural sand from below the concrete slab and made ground (HP3, 0.5m-1.0m) were subjected to a suite of metals and metalloid tests.

The complete test results are presented later (in Appendix C). None of the metal (or metalloid) concentrations were measured above the GAC guidelines.

The maximum measured concentration of *total* chromium of 124mg/kg (from HP3, 0.05m to 0.3m) exceeded the GAC for chromium VI (of 6mg/kg). However, Chromium VI is typically only present in soils in the vicinity of heavy industrial processes and waste deposition. That is not the case here, and there is not any plausible risk of Chromium VI contamination at the site.

No elevated levels of any metal contaminants have been detected at any of the six sampling locations including (WS2 & WS4) from the initial investigation.

5.2 Polycyclic aromatic hydrocarbons (PAHs)

Table 4 (below) gives the GAC (from LQM/CIEH, 2015) for speciated PAH contaminants. These vary with soil organic matter (SOM) content. At this stage, the most onerous SOM of 1% is assumed, which should be reasonably conservative.

Table 4: Soil GACs for PAH – Residential with plant uptake

Element	*SOM of 1%*	*SOM of 2.5%*	*SOM of 6%*
Acenaphthene	210	510	1100
Acenaphthylene	170	420	920
Anthracene	2400	5400	11000
Benzo(a)anthracene	7.2	11	13
Benzo(a)pyrene	2.2	2.7	3
Benzo(b)fluoranthene	2.6	3.3	3.7
Benzo(k)fluoranthene	77	93	100
Benzo(ghi)perylene	320	340	350
Chrysene	15	22	27
Dibenzo(ah)anthracene	0.24	0.28	0.3
Fluoranthene	280	560	890
Fluorene	170	400	860
Indeno(123-cd) pyrene	27	36	41
Naphthalene	2.3	5.6	13
Phenanthrene	95	220	440
Pyrene	620	1200	2000
BaP as Surrogate marker	0.79	0.98	1.1

Five samples, two samples from within the current green area (HP1, 0.1m-0.5m & HP2, 0.1m-0.5m), two samples from below concrete slabs (HP3, 0.05m-0.3m & HP4, 0.05m-0.32m) and one sample of expected natural sand from below the concrete slab and made ground (HP3, 0.5m-1.0m) were subjected to a suite of PAH tests.

The results show that some low-level concentrations of PAHs were detected in the made ground sample from HP3 (0.05m-0.3m), exceedances of the GAC threshold values for sample HP3 (0.05m-0.3m) include Benzo(b)fluoranthene at 10.20mg/kg, Benzo(a)pyrene at 8.43mg/kg and Dibenz(ghi)perylene at 1.49mg/kg. A deeper sample from HP3 (0.5m-1.0m) has no exceedances.

None of the sample locations (HP1, HP2, HP4, WS2 or WS4) with sample depths noted above have concentrations above the relevant GAC threshold values.

5.3 PAH profiling analysis

Double ratios and PAH profiling has been undertaken on the speciated PAH data from the HP3 made ground sample. The plots are shown below (in Figures 1 to 4).

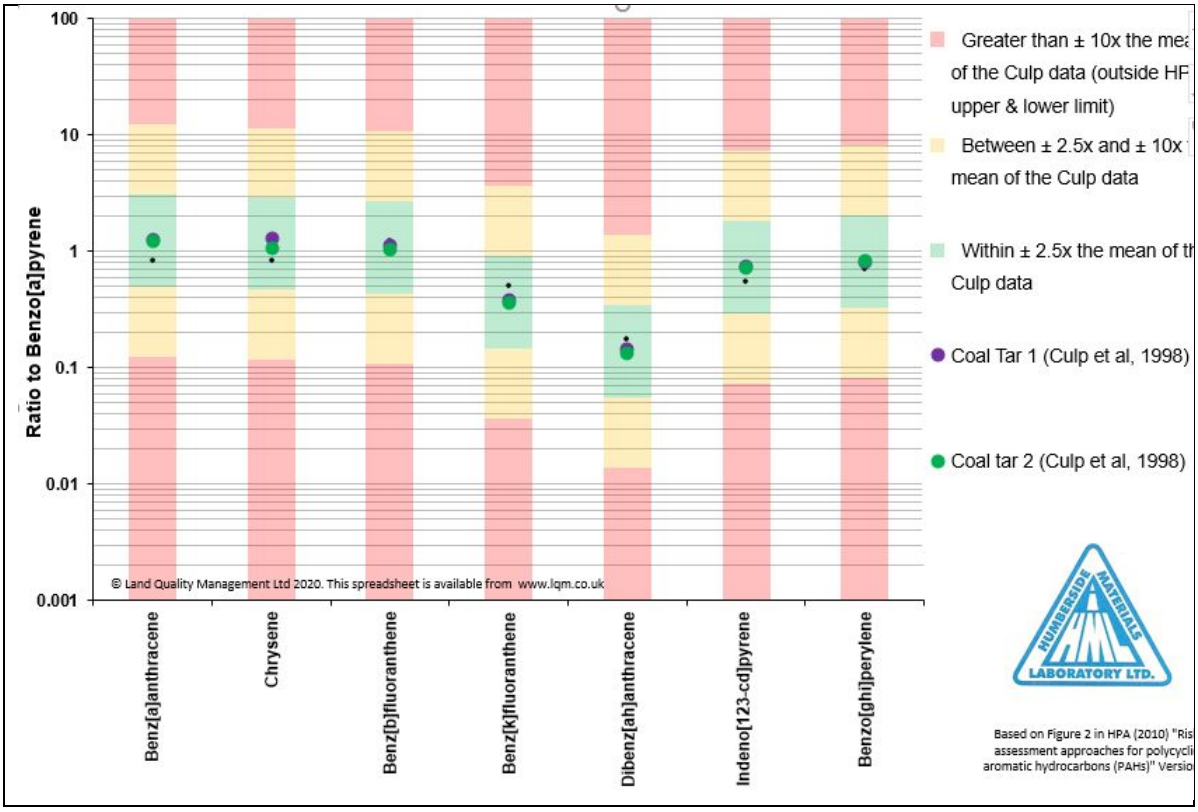

Figure 1 shows the PAH species to benzo(a)pyrene ratios of the measured data lie reasonably close (within 2.5 times the mean) to the Culp et al. (1998) data for most of the PAH species. Therefore, PAH double ratio profiling should be generally applicable to the data.

The profiling plots below (Figures 2 to 4) indicate the samples all have the signature of a *carbonization or coke oven tar* from an *urban background*. The profile clearly falls into the category of *Grass/Wood/Coal Combustion and Coal Tar*.

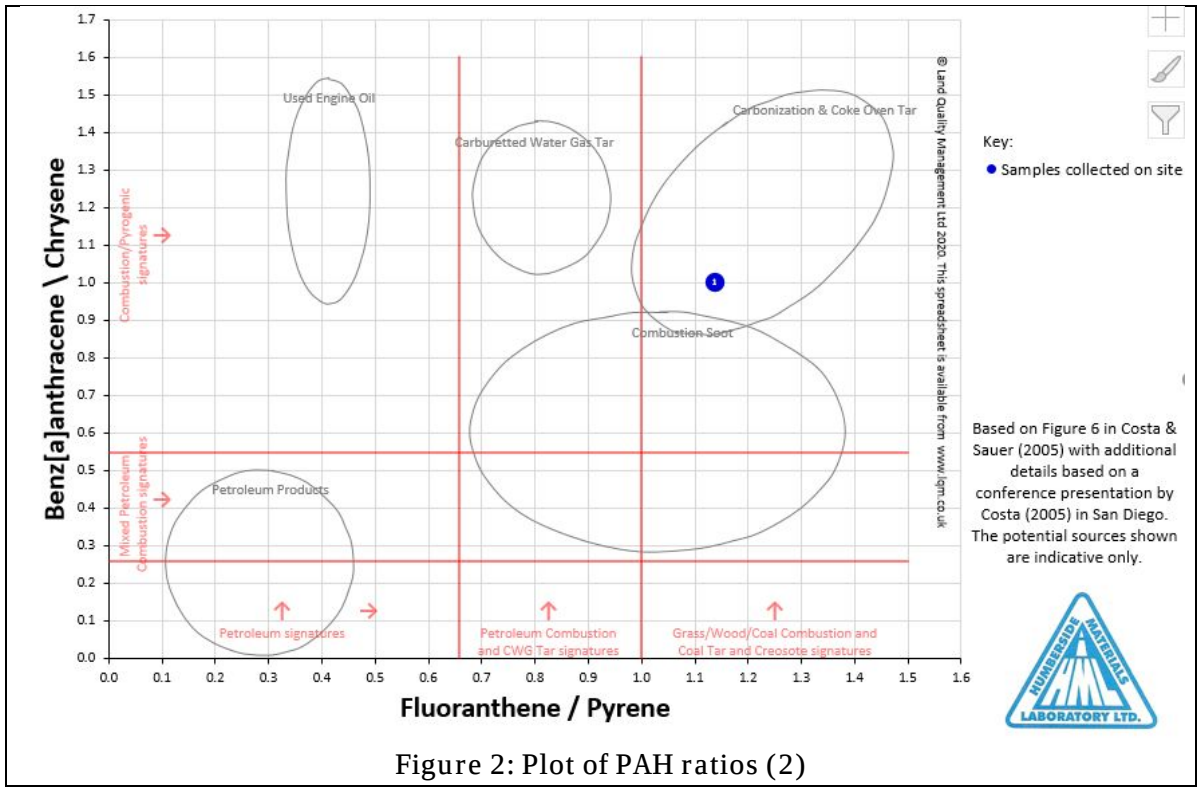

Figure 2: Plot of PAH ratios (2)

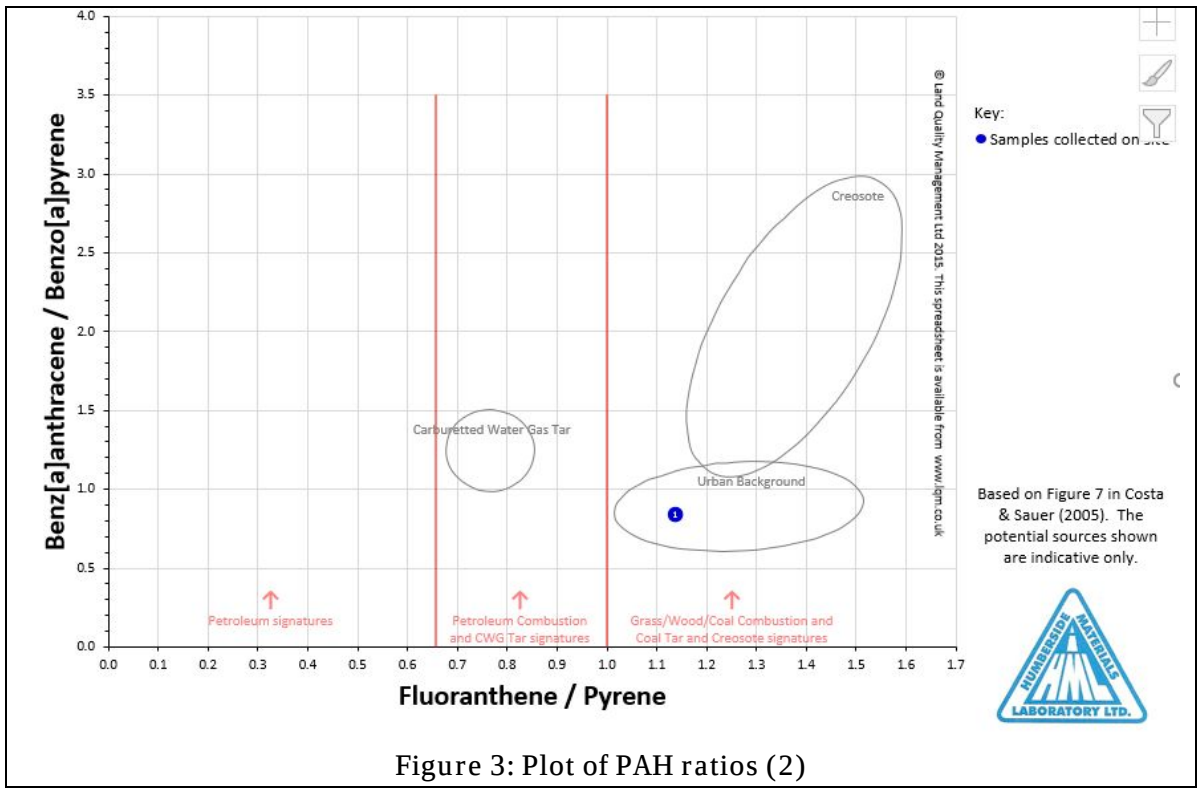

Figure 3: Plot of PAH ratios (2)

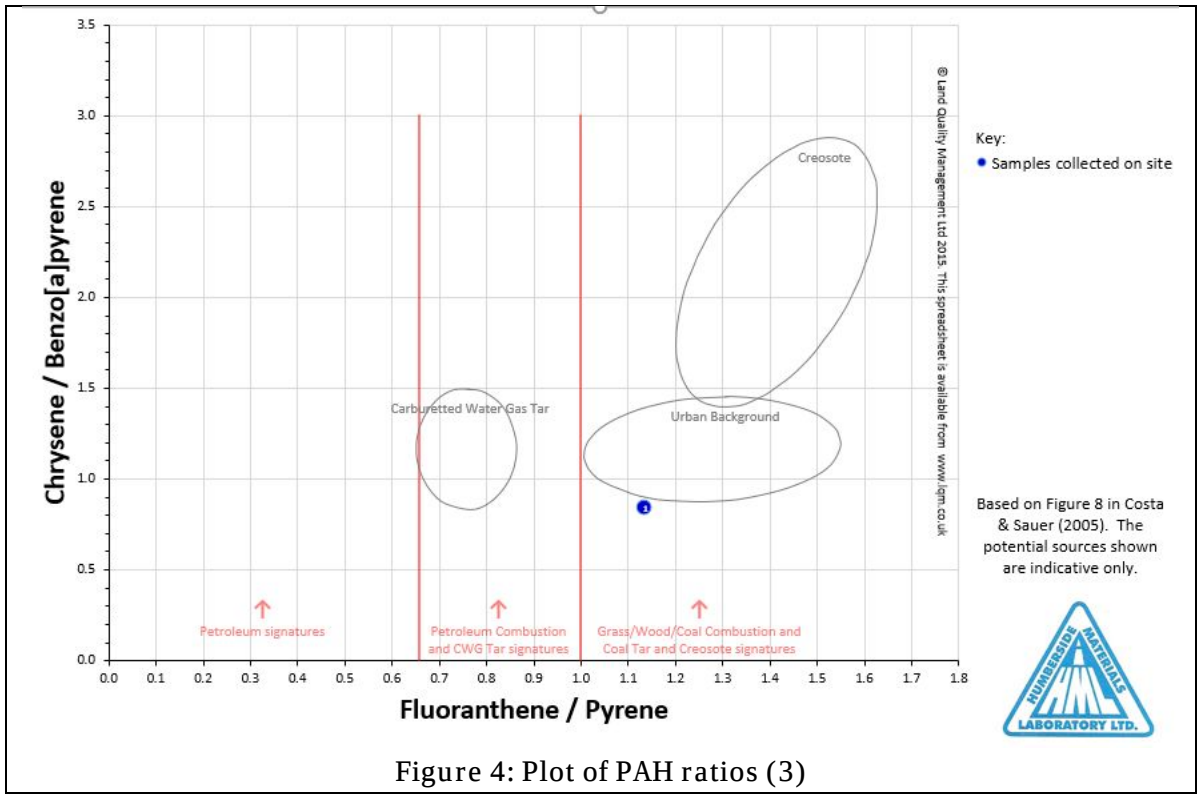

Figure 4: Plot of PAH ratios (3)

The results indicate the source of the low-level PAH contamination in the made ground is likely to be from either (a) coal tar or (b) ash or clinker from burnt wood or coal. The evidence does not point to PAHs from a petroleum hydrocarbon source.

5.4 Asbestos

Five samples, two samples from within the current green area (HP1, 0.1m-0.5m & HP2, 0.1m-0.5m), two samples from below concrete slabs (HP3, 0.05m-0.3m & HP4, 0.05m-0.32m) and one sample of expected natural sand from below the concrete slab and made ground (HP3, 0.5m-1.0m) were subjected to asbestos identification analysis.

No asbestos was detected in any of the four sample locations. The previous investigation did not detect asbestos within the two shallow samples analysed.

5.5 Revised Risk Assessment

Table 9: Revised conceptual site model and risk assessment						
Potential source	*Potential pathway*	*Potential receptor*	*Probability*	*Severity*	*Risk rating*	*Comments*
Potentially contaminated made ground	Direct ingestion or dermal contact with soil, dust and/or vapour inhalation	Human Health Site end users, inc. maintenance workers and site workers (short term risk during construction)	Unlikely	Medium	Medium / Low	Metals were not detected above the GAC guidelines. No asbestos was detected.
	Inhalation of asbestos fibres		Unlikely	Medium	Low	
	Direct contact/leaching (tainting)	Construction (potable water supply pipes)	Unlikely	Mild	Low	
	Direct contact/leaching	Construction (Foundations)	Low likelihood	Mild	Low	
	Surface run off/ lateral migration	Controlled waters	Unlikely	Mild	Low	
Natural organic soils	Inhalation (via ingress and accumulation)	Human health	Unlikely	Medium	Low	Little to no organic material was found. However, more could be present at greater depth.

Risk ratings of *very low* or *low* are not considered significant while ratings of *medium / low* (or above) are deemed potentially hazardous and the associated source-pathway-receptor is taken to be a relevant contamination linkage (RCL) and in need of further consideration.

The above risk assessment indicates that there is potential for contamination linkages associated with the revealed made ground below the existing structure. This was identified within HP3 from the south east section of the existing structure. A sample from below the northern section of the existing structure did not reveal any elevated levels of contamination. Two made ground samples from the initial investigation located around the existing structure did not reveal any elevated levels of contamination.

Sampling from the green area (to the west of the proposed building) and from the natural soil from below the made ground within HP3 has not shown any elevated levels of contamination.

Nevertheless, any unforeseen contamination (e.g. petroleum hydrocarbons odour or staining) encountered during the development of the site should be monitored and reported to the local authority. Work should be halted in any area of the revealed potential contamination and the contamination investigated and assessed to the satisfaction of the local authority.

5.6 Remediation measures

The initial ground investigation recommended that the made ground to be removed from garden areas as made ground is not a growth medium, a topsoil would be required.

This supplementary investigation has identified low levels of PAH contamination within made ground below the existing structure. A sample from the same hand pit HP3 of natural soil below the made ground did not reveal any elevated levels above GAC guidelines. A further three made ground sample locations have not identified any elevated levels.

Considering the findings from the initial investigation and from this supplementary investigation the recommended remediation would be to remove the made ground from garden areas. Any made ground proposed to be below hardstanding areas (e.g concrete or patio areas) may remain on-site. The green area consisting of grass onto soil to the west of the existing structure did not reveal any elevated levels of contamination from the two samples analysed and historical mapping shows this area has not experienced any structural works, this area does not require remediation.

A phase 3 remediation statement and phase 4 validation report will be required to provide the local authority with evidence of remediation to an approved method.

Remediation proposals would be to remove all made ground within proposed soft landscaped areas with validation of exposed natural sands by PAH analysis to mitigate any migration concerns. If PAH migration concerns can be mitigated a validated topsoil cover system totalling 600mm in depth will not be required. Any topsoil imported on to site will still require validating to prove the source and suitability for a residential development. It is recommended that this is undertaken after structural works are completed to prevent cross contamination.

The health risk to construction workers should be mitigated by suitable safe working practices. This includes the provision of personal protective equipment and hygiene facilities along with the implementation of safe working practices.

5.7 Ground gas protection measures

Discussed within the initial ground investigation.

6 SUMMARY & CONCLUSIONS

6.1 Ground conditions

The findings of the investigation indicate the following sub-strata at the site (in descending order).

- Topsoil (in HP1 & HP2) - Dark brown fine SANDY TOPSOIL (to 0.3m-0.4m below ground level (bgl))
- Made Ground (in WS2, WS4, HP3 & HP4) – Gravel with dark brown silty sandy or dark brown gravelly silty sand including ash and brick. HP4 included fragments of concrete, brick and chalk (to 0.2m-0.32m bgl)
- Sutton Sand Formation
  - (in HP3) Dense dark brown silty fine SAND (to 0.6m bgl)
  - (in HP1, HP2, HP3) – Dense yellow brown fine to medium SAND (to at least 1.0m bgl)
  - (in WS2, WS4, HP1, HP2) – Dense orange brown fine to medium slightly silty SAND (to at least 2.5m bgl(WS2 & WS4))

The hand pits and previous windowless sampler holes have been located in the most onerous positions in relation to the proposed development. WS1 to WS3 and HP1 to HP2 have been located within proposed soft landscaped areas. HP2 and HP4 were located below existing structures and WS4 is located within the proposed drive/garden path area. An approximate plan within appendix A shows the proposed plot and sample locations.

6.2 Contamination test results

No asbestos or elevated levels of metals have been detected in any samples of near surface soils or made ground from any of the hand pits or previous window sample boreholes. A sample of the natural soil from below the existing structure and made ground did not reveal any elevated levels of contamination for metals or PAH and no asbestos was identified.

No elevated levels PAH have been recorded within the green area to the west of the existing structures. Two made ground samples from around the existing structure did not reveal any elevated levels of PAH identified within the initial ground investigation. One sample of the two made ground samples from below the existing structure identified slightly elevated PAH fractions associated with either (a) coal tar or (b) ash or

clinker from burnt wood or coal. The evidence does not point to PAHs from a petroleum hydrocarbon source.

No visual or olfactory evidence of contamination beyond the scope of this report was found during site works for tis supplementary investigation.

6.3 Contamination assessment

Risk assessment indicates that there is potential for contamination linkages associated with the revealed made ground below the existing structure. Made ground from around the existing structure and existing natural soil within the green area to the west of the existing structures did not reveal any elevated levels.

Nevertheless, any unforeseen contamination (e.g. petroleum hydrocarbons odour or staining) encountered during the development of the site should be monitored and reported to the local authority. Work should be halted in any area of the revealed potential contamination and the contamination investigated and assessed to the satisfaction of the local authority.

Buried concrete should be designed to BRE Special Digest 1 and any water pipework should comply with local water authority requirements. Any health risk to construction workers should be mitigated by suitable safe working practices.

6.3 Remediation proposals

Remove made ground within proposed soft landscaped areas. PAH analysis at the base of excavations to assess migration may prove a validated topsoil cover system to a depth of 600mm is not required. A phase 3 method statement and phase 4 validation report will be required.

6.4 Ground gas protection measures

Discussed within the initial ground investigation.

- End of Report -

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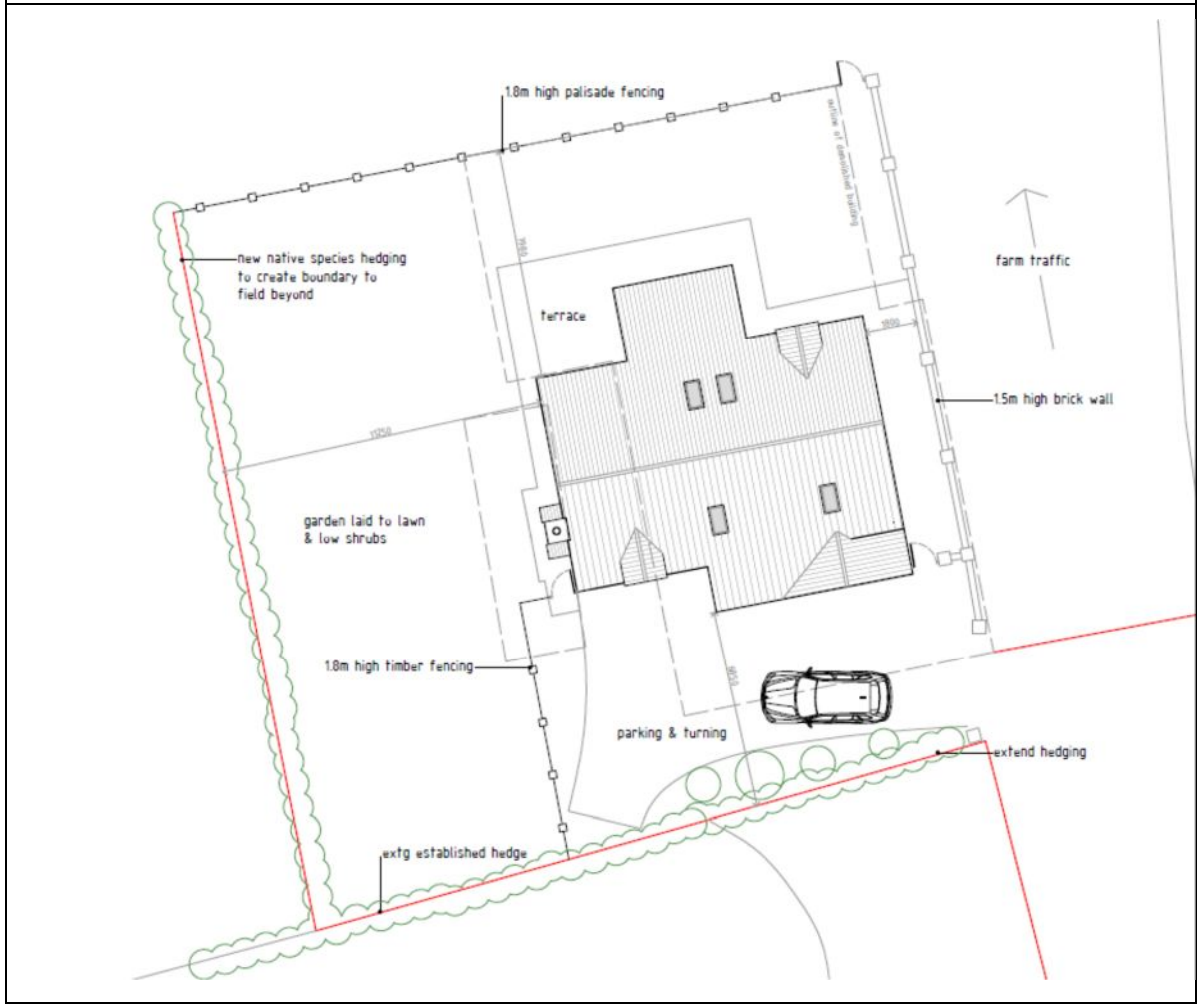
Appendix A

Plans & Photographs

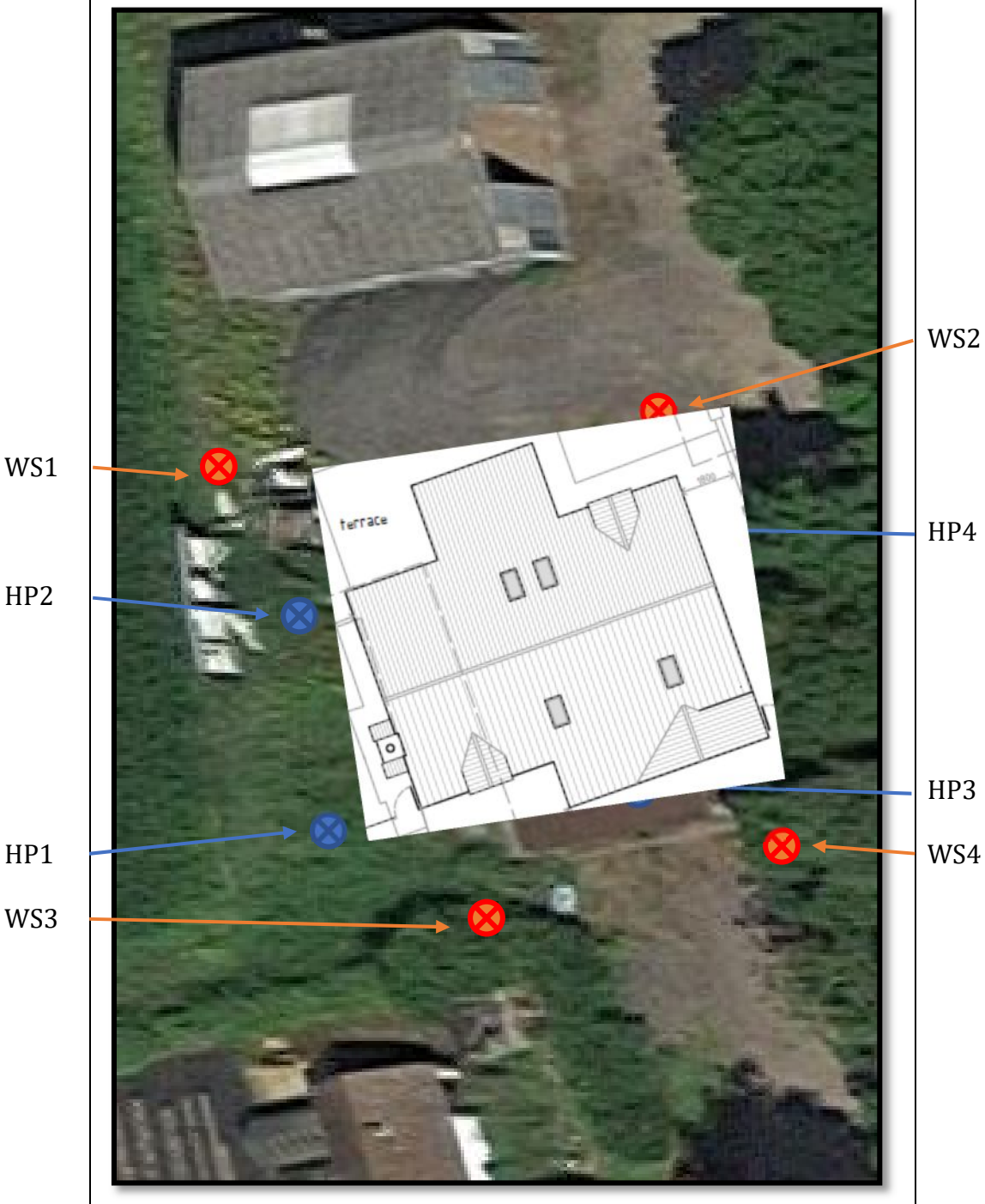
Mendle Farm, Holme – proposed development plan



Mendle Farm, Holme – WS/HP location plan

March 2020

Mendle Farm, Holme – Estimated location



March 2020

Aerial view of site
(Screenshot from Google maps)

Green area to the west of existing structure

Existing structure (South east)

Existing structure (north)

Appendix B

Exploratory hole logs

HUMBERSIDE MATERIALS LABATORY Ltd.
Atherton Way, Brigg
North Lincs DN20 8AR
Tel & Fax 01652 652753

email info@humbersidematerialslab.co.uk

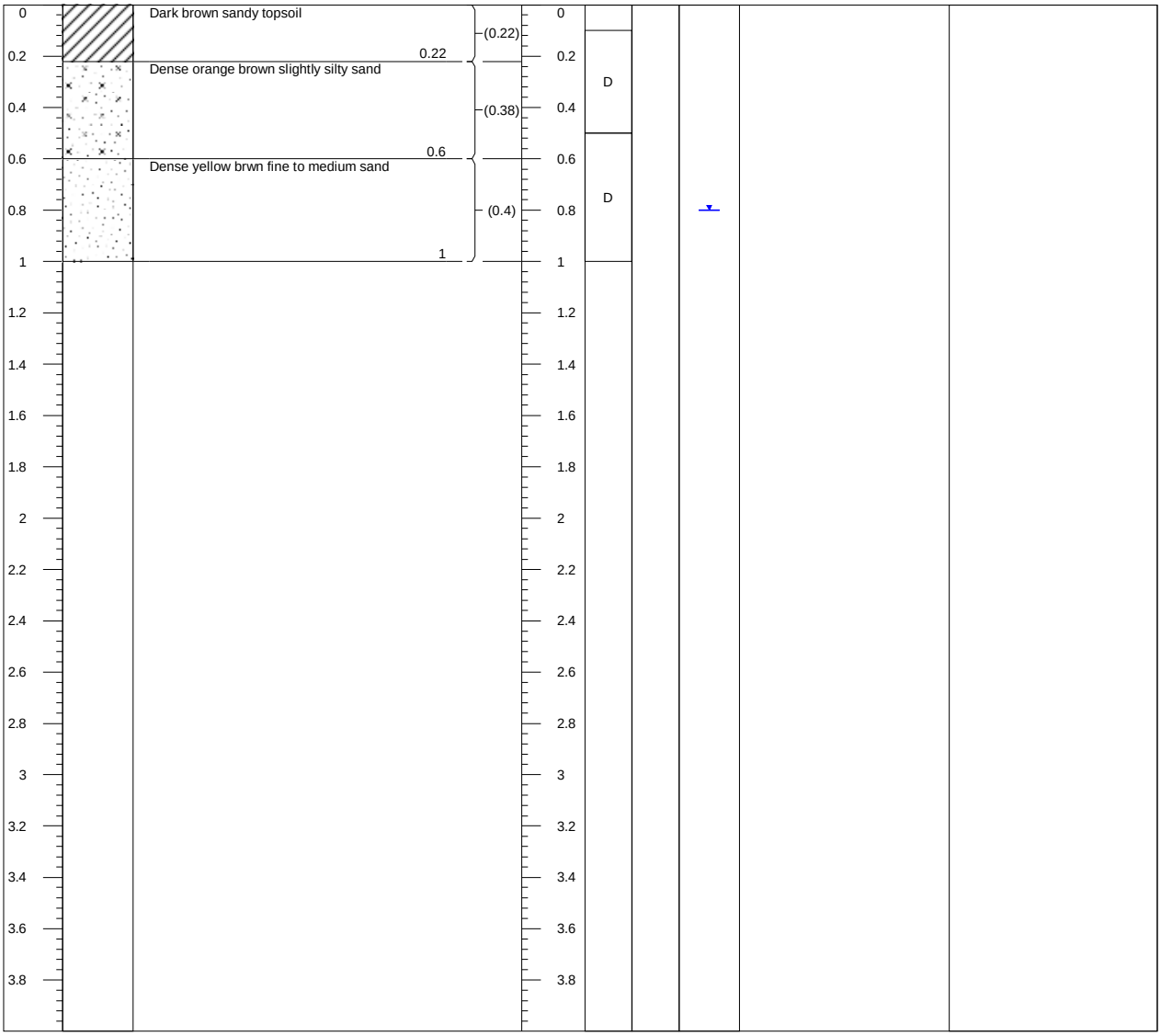
TRIAL PIT LOG

Trial pit No **1**

Client :- JW Richardson
Site :- Mendle Farm, Holme
Project No :- 5063

Location :- see site plan
Date :- 14-Feb-20

Coordinates E: N:
Elevation :-
Excavated by :- Hand



Sample Key
B Bulk
D Disturbed
W Water
SS Split spoon
C Cone

Notes :-

File Ref :- 1260 / 5063
Logged by :- C. Chrost

HUMBERSIDE MATERIALS LABATORY Ltd.
Atherton Way, Brigg
North Lincs DN20 8AR
Tel & Fax 01652 652753

email info@humbersidematerialslab.co.uk

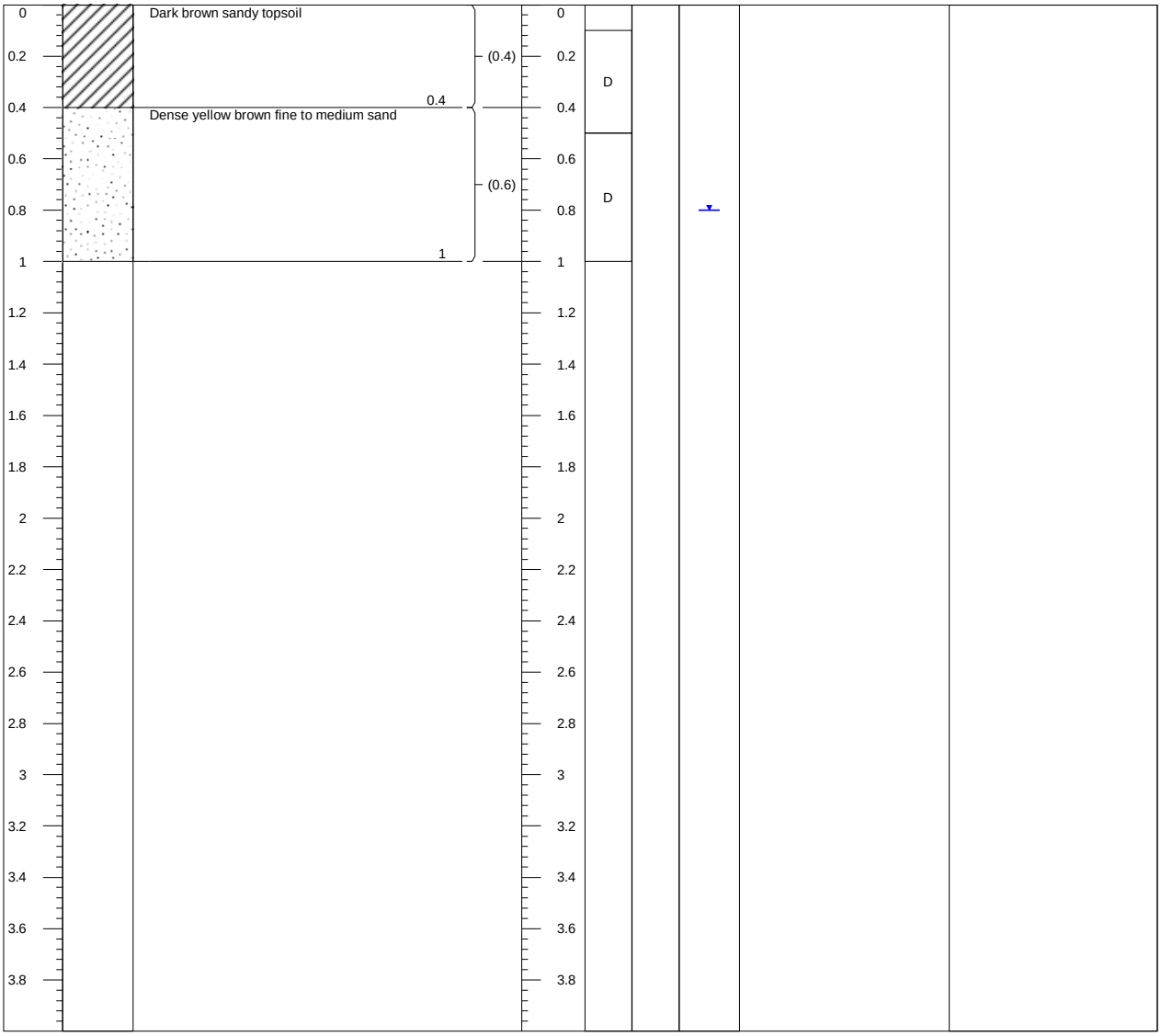
TRIAL PIT LOG

Trial pit No **2**

Client :- JW Richardson
Site :- Mendle Farm, Holme
Project No :- 5063

Location :- see site plan
Date :- 14-Feb-20

Coordinates E: N:
Elevation :-
Excavated by :- Hand



Sample Key
B Bulk
D Disturbed
W Water
SS Split spoon
C Cone

Notes :-

File Ref :- 1260 / 5063
Logged by :- C. Chrost

HUMBERSIDE MATERIALS LABATORY Ltd.
Atherton Way, Brigg
North Lincs DN20 8AR
Tel & Fax 01652 652753

email info@humbersidematerialslab.co.uk

TRIAL PIT LOG

Trial pit No **3**

Client :- JW Richardson
Site :- Mendle Farm, Holme
Project No :- 5063

Location :- see site plan
Date :- 14-Feb-20

Coordinates E: N:
Elevation :-
Excavated by :- Hand

Sample Key
B Bulk
D Disturbed
W Water
SS Split spoon
C Cone

Notes :-

File Ref :- 1260 / 5063
Logged by :- C. Chrost

HUMBERSIDE MATERIALS LABATORY Ltd.
Atherton Way, Brigg
North Lincs DN20 8AR
Tel & Fax 01652 652753

email info@humbersidematerialslab.co.uk

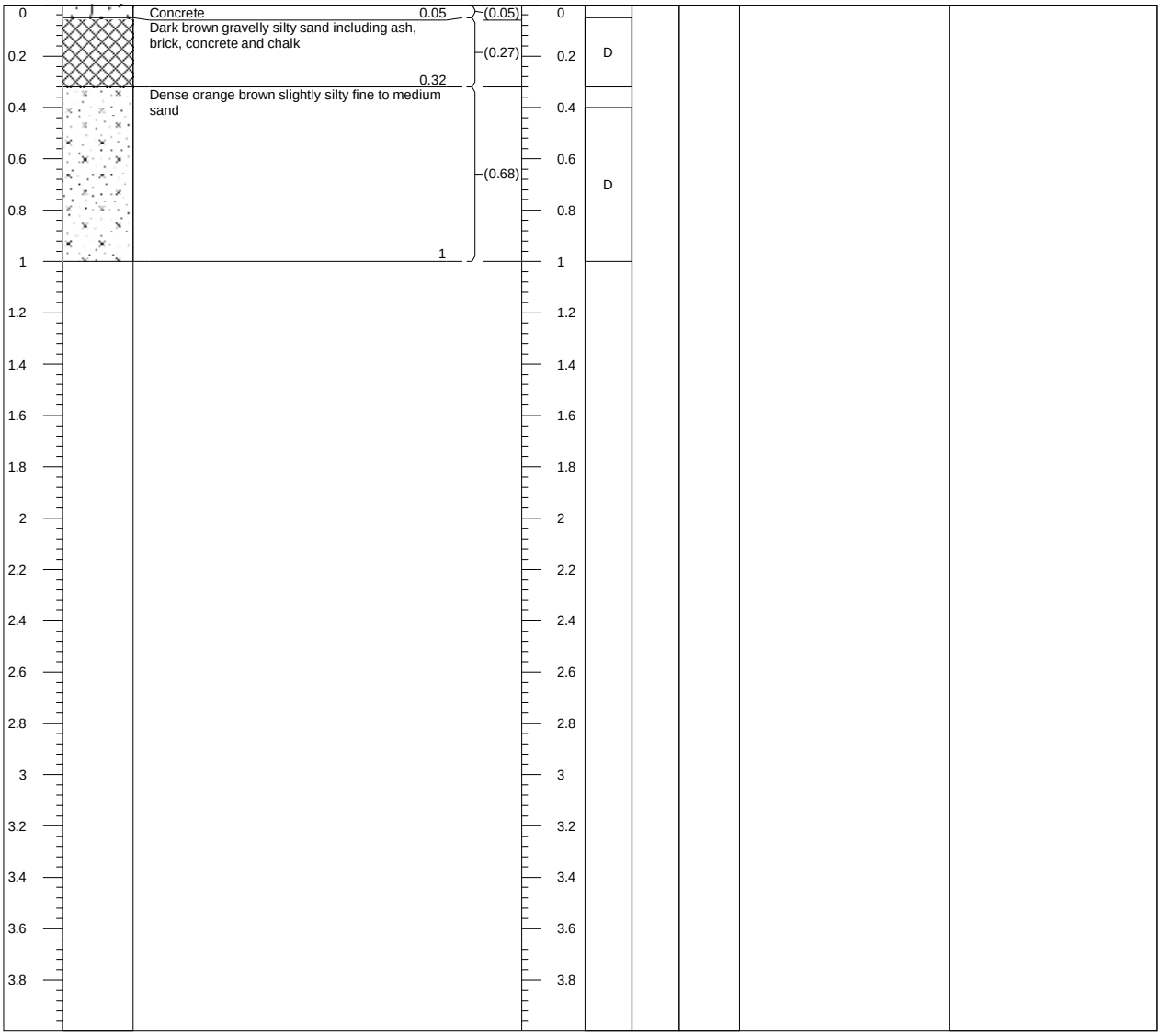
TRIAL PIT LOG

Trial pit No **4**

Client :- JW Richardson
Site :- Mendle Farm, Holme
Project No :- 5063

Location :- see site plan
Date :- 14-Feb-20

Coordinates E: N:
Elevation :-
Excavated by :- Hand



Sample Key
B Bulk
D Disturbed
W Water
SS Split spoon
C Cone

Notes :-

File Ref :- 1260 / 5063
Logged by :- C. Chrost

Appendix C

Test results

2531

ANALYTICAL TEST REPORT

Contract no:	84556
Contract name:	Mendle Farm, Holme
Client reference:	1260/5063
Clients name:	Humberside Materials Laboratory
Clients address:	Atherton Way Brigg North Lincolnshire DN20 8AR
Samples received:	20 February 2020
Analysis started:	20 February 2020
Analysis completed:	27 February 2020
Report issued:	27 February 2020

Notes:

Opinions and interpretations expressed herein are outside the UKAS accreditation scope.
Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.
All testing carried out at Unit 6 Parkhead, Stanley, DH9 7YB, except for subcontracted testing.
Methods, procedures and performance data are available on request.
Results reported herein relate only to the material supplied to the laboratory.
This report shall not be reproduced except in full, without prior written approval.
Samples will be disposed of 6 weeks from initial receipt unless otherwise instructed.

Key:

U UKAS accredited test
M MCERTS & UKAS accredited test
$ Test carried out by an approved subcontractor
I/S Insufficient sample to carry out test
N/S Sample not suitable for testing
NAD No Asbestos Detected

Approved by:

[redacted]

Dave Bowerbank
Customer Support Hero

Chemtech Environmental Limited

SAMPLE INFORMATION

MCERTS (Soils):

Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions. MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample. Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

All results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.
Analytical results are inclusive of stones.

Lab ref	Sample id	Depth (m)	Sample description	Material removed	% Removed	% Moisture
84556-1	S/55319	-	Sand with Gravel	-	-	15.9
84556-2	S/55320	-	Sand with Gravel	-	-	12.7
84556-3	S/55321	-	Sand with Gravel	-	-	8.8
84556-4	S/55322	-	Sand with Gravel	-	-	10.3
84556-5	S/55323	-	Sand with Gravel	-	-	15.2

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SOILS

Lab number			84556-1	84556-2	84556-3	84556-4	84556-5
Sample id			S/55319	S/55320	S/55321	S/55322	S/55323
Location			HP1-1	HP2-1	HP3-1	HP3-2	HP4-1
Depth (m)			-	-	-	-	-
Date sampled			14/02/2020	14/02/2020	14/02/2020	14/02/2020	14/02/2020
Test	**Method**	**Units**					
Arsenic (total)	CE127 M	mg/kg As	3.2	11	8.7	4.0	7.0
Beryllium (total)	CE127 U	mg/kg Be	<1	<1	2.3	<1	2.3
Boron (water soluble)	CE063 M	mg/kg B	<0.5	<0.5	1.2	<0.5	0.9
Cadmium (total)	CE127 M	mg/kg Cd	<0.2	<0.2	0.3	<0.2	0.3
Chromium (total)	CE127 M	mg/kg Cr	9.5	4.7	124	26	14
Copper (total)	CE127 M	mg/kg Cu	5.1	5.9	14	5.3	14
Lead (total)	CE127 M	mg/kg Pb	8.8	30	36	24	35
Mercury (total)	CE127 M	mg/kg Hg	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel (total)	CE127 M	mg/kg Ni	5.6	3.1	12	4.5	8.1
Selenium (total)	CE127 M	mg/kg Se	0.5	0.6	2.1	1.0	1.8
Vanadium (total)	CE127 M	mg/kg V	13	9.5	61	20	39
PAH							
Naphthalene	CE087 M	mg/kg	0.08	<0.02	0.17	<0.02	0.04
Acenaphthylene	CE087 M	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02
Acenaphthene	CE087 M	mg/kg	<0.02	<0.02	0.56	<0.02	<0.02
Fluorene	CE087 U	mg/kg	<0.02	<0.02	0.38	<0.02	<0.02
Phenanthrene	CE087 M	mg/kg	0.47	0.07	10.60	0.04	0.75
Anthracene	CE087 U	mg/kg	<0.02	<0.02	2.04	0.02	0.11
Fluoranthene	CE087 M	mg/kg	0.61	0.21	14.25	0.13	1.38
Pyrene	CE087 M	mg/kg	0.52	0.19	12.54	0.13	1.17
Benzo(a)anthracene	CE087 U	mg/kg	0.20	0.10	7.07	0.08	0.45
Chrysene	CE087 M	mg/kg	0.35	0.13	7.05	0.07	0.82
Benzo(b)fluoranthene	CE087 M	mg/kg	0.47	0.19	10.20	0.13	0.82
Benzo(k)fluoranthene	CE087 M	mg/kg	0.24	0.08	4.23	0.03	0.41
Benzo(a)pyrene	CE087 U	mg/kg	0.28	0.12	8.43	0.10	0.66
Indeno(123cd)pyrene	CE087 M	mg/kg	0.16	0.08	4.64	<0.02	0.41
Dibenz(ah)anthracene	CE087 M	mg/kg	0.04	<0.02	1.49	<0.02	0.14
Benzo(ghi)perylene	CE087 M	mg/kg	0.20	0.11	5.88	<0.02	0.53
PAH (total of USEPA 16)	CE087	mg/kg	3.62	1.27	89.5	0.73	7.67
Subcontracted analysis							
Asbestos (qualitative)	$	-	NAD	NAD	NAD	NAD	NAD

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE127	Arsenic (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg As
CE127	Beryllium (total)	Aqua regia digest, ICP-MS	Dry	U	1	mg/kg Be
CE063	Boron (water soluble)	Hot water extract, ICP-OES	Dry	M	0.5	mg/kg B
CE127	Cadmium (total)	Aqua regia digest, ICP-MS	Dry	M	0.2	mg/kg Cd
CE127	Chromium (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cr
CE127	Copper (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cu
CE127	Lead (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Pb
CE127	Mercury (total)	Aqua regia digest, ICP-MS	Dry	M	0.5	mg/kg Hg
CE127	Nickel (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Ni
CE127	Selenium (total)	Aqua regia digest, ICP-MS	Dry	M	0.3	mg/kg Se
CE127	Vanadium (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg V
CE087	Naphthalene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Acenaphthylene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Acenaphthene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Fluorene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Phenanthrene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Anthracene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Fluoranthene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Pyrene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Benzo(a)anthracene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Chrysene	Solvent extraction, GC-MS	As received	M	0.03	mg/kg
CE087	Benzo(b)fluoranthene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Benzo(k)fluoranthene	Solvent extraction, GC-MS	As received	M	0.03	mg/kg
CE087	Benzo(a)pyrene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Indeno(123cd)pyrene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Dibenz(ah)anthracene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Benzo(ghi)perylene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	PAH (total of USEPA 16)	Solvent extraction, GC-MS	As received		0.34	mg/kg
$	Asbestos (qualitative)	HSG 248, Microscopy	Dry	U	-	-

Chemtech Environmental Limited

DEVIATING SAMPLE INFORMATION

Comments
Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.
For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.
Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

Key

N	No (not deviating sample)
Y	Yes (deviating sample)
NSD	Sampling date not provided
NST	Sampling time not provided (waters only)
EHT	Sample exceeded holding time(s)
IC	Sample not received in appropriate containers
HP	Headspace present in sample container
NCF	Sample not chemically fixed (where appropriate)
OR	Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
84556-1	S/55319	-	N	
84556-2	S/55320	-	N	
84556-3	S/55321	-	N	
84556-4	S/55322	-	N	
84556-5	S/55323	-	N	