



GRM Development Solutions Ltd
Laurus House
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DE14 2WH

Tel: 01283 551 249
Web: www.grm-uk.com

Our Ref: P9347 RCR

Date: 1st March 2024

Peter Draper
Miller Homes
By Email Only

Dear Peter,

RE: Markfield Road, Ratby – Interim Remediation Completion Report

Introduction

The following should be read in conjunction with the GRM Development Solutions Ltd (GRM) Remediation Method Statement and Gas Protection Measures Design and Verification Plan (RMS) (Ref: GRM/P9347/RMS&GVP/F.1) Dated October 2020 and Chemical Analysis Of Buried Topsoil Letter Report (Ref: P9347/BURTS) Dated 10th November 2020.

The RMS summarised that ash laden made ground was present within the footprint of a former stables area, located in the south eastern area of the site. The made ground was underlain by c. 0.3m layer of buried topsoil. Chemical analysis of the made ground found that it was pervasively contaminated with PAH, whereas the buried topsoil was chemically clean (further analysis of it was recommended the confirm this).

It is generally considered inappropriate to leave topsoil in place within the footprint of proposed structures or beneath any proposed earthworks, due to the propensity of it to generate ground gas. Accordingly, it was considered that remediation by excavation and relocation would be the most appropriate form of remediation for the identified made ground. In the first instance, the made ground was to be removed and stockpiled. The topsoil underneath was then to be removed and stockpiled separately to other site-won topsoil, and subjected to chemical analysis to determine its suitability for re-use.

It was understood that it was the Client's preference to relocate the contaminated made ground to areas of POS. To this end it was proposed to re-introduce the made ground into part of the excavation progressed to remove the topsoil, as illustrated on the Remediation Plan presented in Appendix A. The area was designated as POS and so a 300mm clean soil capping layer would be required on top of the made ground to protect end users.

Should there have been any made ground remaining after filling the main designated area, any remaining material would be introduced into the area of POS to the north (see Remediation Plan), with the same soil capping layer being placed.



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The initial removal of the contaminated made ground and underlying topsoil was to be verified by way of inspection and photographs. The relocation of the made ground to areas of POS was to have full documentation, to illustrate exactly where it had been used. Once placed and covered with the required thickness of clean soil capping, the thickness of the soil capping required verification.

All of the proposed remedial works have now been completed, and this Completion Report provides a full account of the works undertaken and the verification of them.

Management Of Made Ground And Buried Topsoil

The excavation of the made ground and buried topsoil, and the introduction of the made ground into the main designated area, was undertaken in October 2020, GRM undertaking part time monitoring of the works to inspect the base of the excavation, ensure that all materials had been removed and relocated as necessary. Supporting photographs are presented in Appendix B.

The made ground and buried topsoil were stockpiled separately in an area to the north of the main works area.

As reported in the GRM Letter Report P9347/BURTS, the buried topsoil was subjected to further chemical analysis, this concluding that for the most part the concentration of contaminants were below the relevant assessment criteria for residential end use with plant uptake and POS, but that isolated elevated concentrations of PAH were present, that were in excess of the relevant assessment criteria for residential end use with plant uptake, but below those for POS. It was, therefore, concluded that the buried topsoil could be used as a growing medium in areas of POS, but not gardens and it is understood that the Client followed this recommendation.

Once the made ground and topsoil had been removed, as much of the made ground as possible was re-introduced into the part of the excavation that was to be covered with POS; the remainder of the excavation was filled with clean site won arisings from roads and sewers excavations. Due to the volume of the made ground, and proposed finished levels, not all of it could be re-introduced into the designated part of the excavation, and so the surplus was placed in the other designated area of POS to the north, this being completed by January 2021.

Following the filling of the excavation (with made ground or clean arisings) and placement of the surplus material in the northern area of POS, a car park (and ultimately a site compound) was constructed over the main area of POS and the northern area of POS covered with a protective layer of clean site won arisings. The areas were then to be covered with the required clean capping layer at the latter stages of the development.

Clean Capping Layer In the Northern Area Of POS

The northern area of POS was covered with the clean soil capping layer by September 2023 and GRM attended site to verify the thickness of the capping and the soils used in its construction. Supporting Photographs are presented in Appendix C.

Verification Of Soil Capping Thickness

Three hand dug trial pits (POS1 to POS3) were excavated in the northern area of POS to confirm the thickness of capping present. The excavations confirmed that at least 300mm of capping was present in every location.

Chemical Verification Of Soil Used In Capping

Three samples of the material used to construct the soil capping layer (i.e. topsoil), and three samples of topsoil that was stockpiled nearby, were submitted for chemical analysis for a general suite of contaminants including metals, inorganics, speciated PAH, speciated hydrocarbons and asbestos.

The chemical analysis results, which are presented in Appendix C, have been compared to the GRM Tier 1 Assessment Criteria (TAC) for both residential end use with plant uptake and residential POS, a copies of which are also presented in the same appendix. The values for a soil organic matter (SOM) of 2.5% have been used as this reflects the lowest SOM recorded in the analysis. Benzo(a)pyrene has been used as a surrogate marker for the genotoxic PAH compounds, with the exception of naphthalene.

In summary, the concentrations of all contaminants in both the in-situ topsoil and stockpiled topsoil are below their respective TAC for both residential end use with plant uptake and residential POS, and no asbestos fibres have been identified. Therefore, the topsoil used in the clean capping is considered fit for purpose, and the stockpiled topsoil is suitable for use in the remainder of the development (i.e. gardens or the remaining area of POS).

Unforeseen Made Ground

Whilst preparing the gardens of Plots 138 to 145, which are located to the immediate west of the main area of POS where the contaminated made ground was buried, the Client requested that GRM attend site to inspect the area to confirm that none of the made ground originally identified was present within the footprint of them, so to satisfy the NHBC who had conditioned the Plots.

GRM progressed several trial pits across the gardens of the Plots to inspect the near surface strata, field notes being presented in Appendix D. The ash laden made ground identified originally was not present in the any of the trial pits excavated; however, made ground comprising reworked natural clay with whole bricks and concrete was identified in the gardens of Plots 142 to 144.

As the made ground had not previously been identified, GRM collected three samples of it and subjected them to chemical analysis for a general suite of contaminants including metals, inorganics, speciated PAH and asbestos.

The chemical analysis results, which are presented in Appendix D, have been compared to the GRM TAC for residential end use with plant uptake, a copy of which is also presented in the same appendix. The values for a soil organic matter (SOM) of 1% have been used as this reflects the lowest SOM recorded in the analysis. Benzo(a)pyrene has been used as a surrogate marker for the genotoxic PAH compounds, with the exception of naphthalene.

In summary, the concentrations of all contaminants are below their respective TAC for residential and use with plant uptake and no asbestos fibres have been identified. Therefore, the made ground does not pose a risk to human health.

As the ash laden made ground was not presented in the gardens, and the cohesive made ground has been confirmed to not pose a risk to human health, it was considered that the gardens simply required a standard growing medium of topsoil.

Clean Capping Layer In the Eastern Area Of POS

The eastern area of POS was covered with the clean soil capping layer by February 2023 and GRM attended site to verify the thickness of the capping and the soils used in its construction. Supporting Photographs are presented in Appendix E.

Verification Of Soil Capping Thickness

Five hand dug trial pits (POS 1 to POS 5) were excavated in the eastern area of POS to confirm the thickness of capping present. The excavations confirmed that at least 360mm of capping was present in every location.

Chemical Verification Of Soil Used In Capping

As the topsoil used in the construction of the soil capping layer was site won and from the same stockpile that was used for the northern area of POS, it was considered unnecessary to undertake further chemical analysis of it.

Conclusions

It is considered that the remedial strategy has been successfully implemented and there is no longer a risk to end users.

We trust this is suitable for your current requirements, should you require any further information or would like any clarification of the points raised please do not hesitate to contact us.

Yours sincerely,
for GRM Development Solutions Ltd



Matthew Tomkins BSc (Hons) PGDip FGS
Acting Principal Engineering Geologist

Appendices

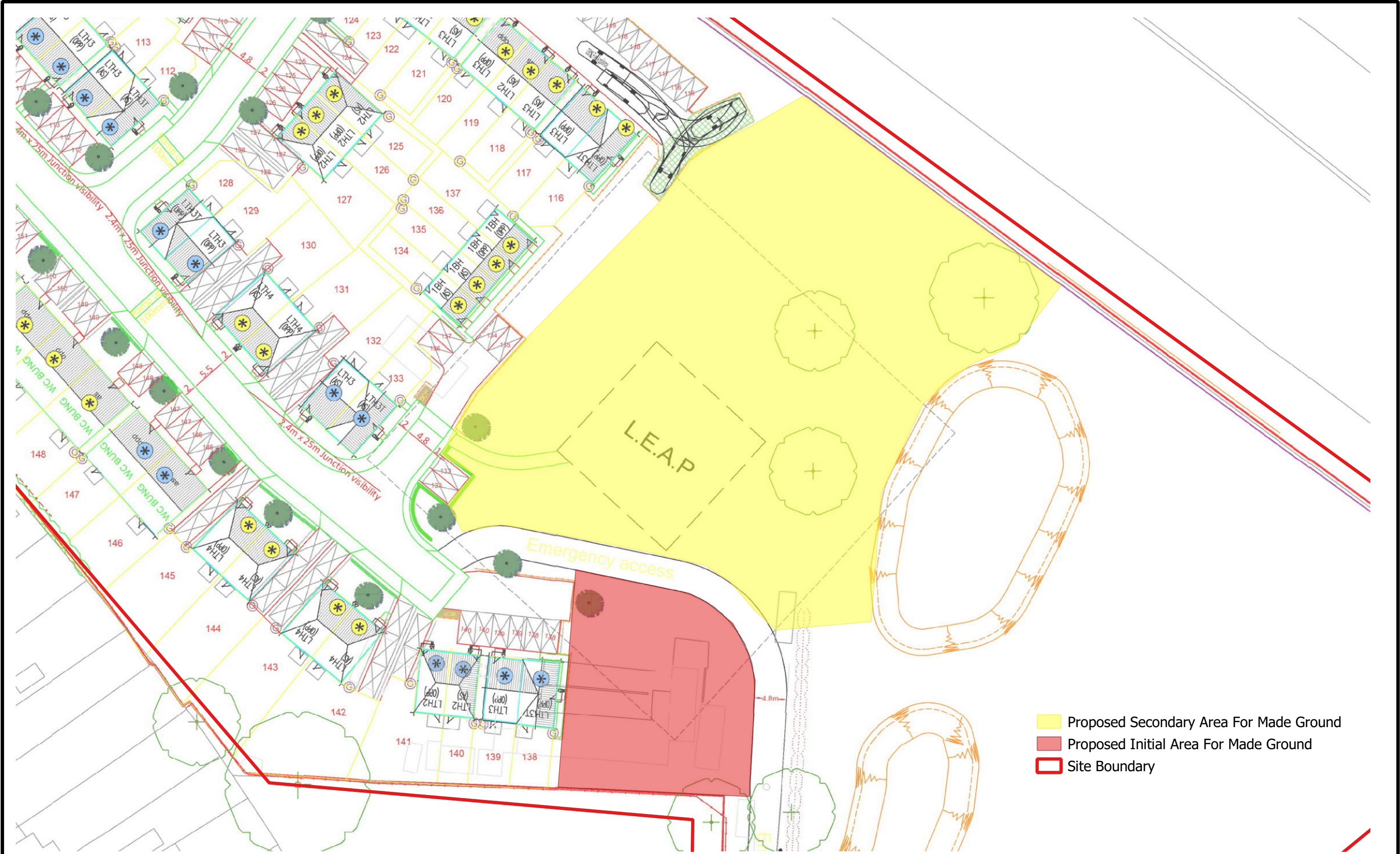
Appendix A.....	Remediation Plan
Appendix B.....	Supporting Information For Contaminated Soil Management
Appendix C.....	Supporting Information For Soil Capping Verification (North)
Appendix D.....	Supporting Information Unforeseen Made Ground
Appendix E.....	Supporting Information For Soil Capping Verification (East)



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- Proposed Secondary Area For Made Ground
- Proposed Initial Area For Made Ground
- Site Boundary

NOTES:	CLIENT:	MILLER HOMES EAST MIDLANDS	PROJECT No:	P9347	DATE:	10/2020	DESIGN/DRAWN:	MJT	 GRM Development Solutions Ltd Tel: 01283 551 249 mail@grm-uk.comwww.grm-uk.com	
	PROJECT:	MARKFIELD ROAD, RATBY	DRAWING NUMBER:		REMP		ISSUE:			REV A FINAL
	TITLE:	REMEDIATION PLAN								
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**Excavation Of Made
Ground and Topsoil**



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PROJECT:

Markfield Road, Ratby

TITLE:

**Supporting Photographs – Soil
Management**

SCALE@SIZE:

NTS

ISSUE:

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**Excavation Of Made
Ground and Topsoil**



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Re-Introduction Of Made Ground

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**Buried Topsoil
Stockpile**



**Made Ground
Stockpile**

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**Surplus Made Ground
In Northern
POS**

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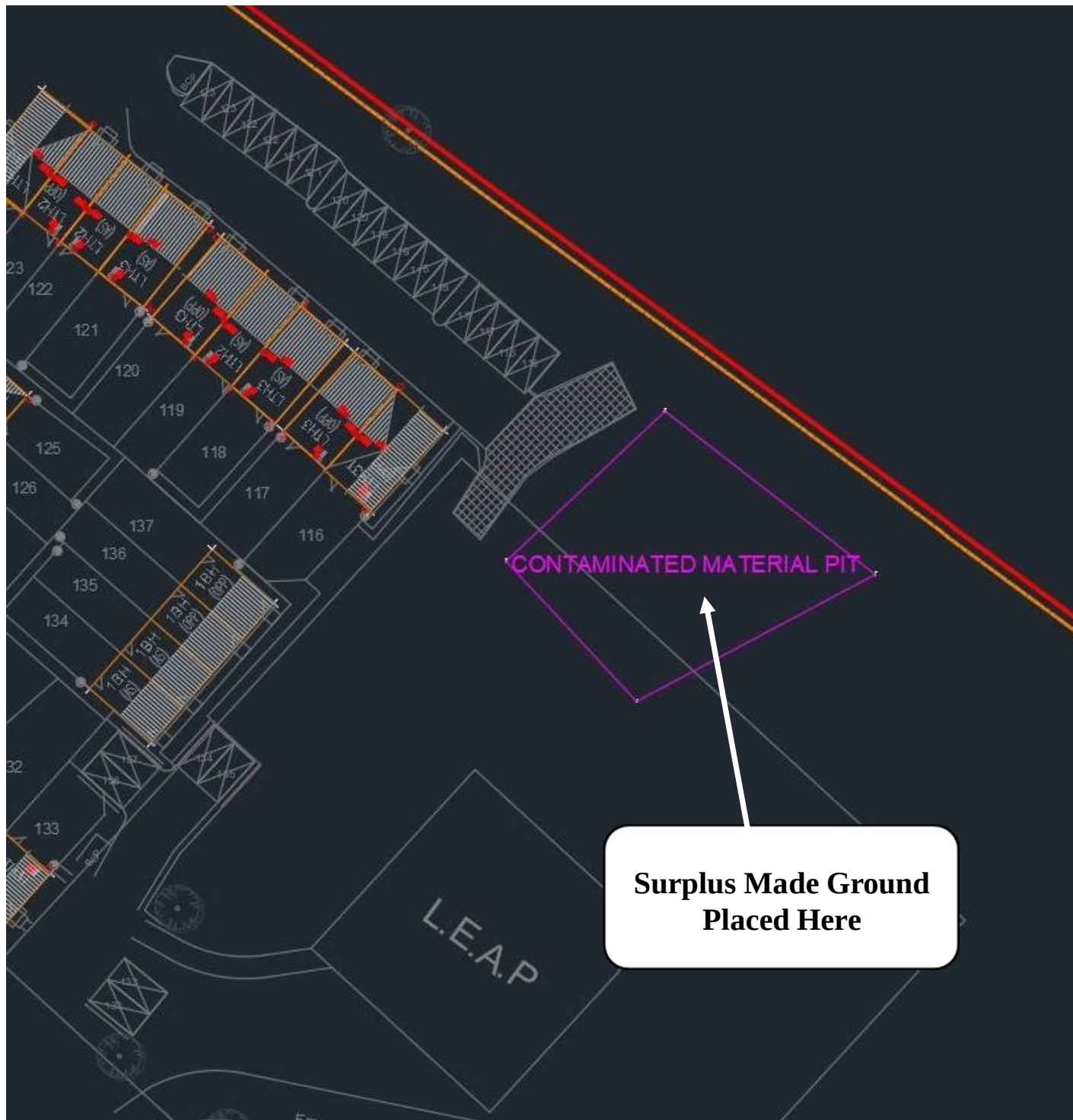
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Miller Homes	
PROJECT:	
Markfield Road, Ratby	
TITLE:	
Supporting Photographs – Capping Verification POS 1	
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PROJECT:

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TITLE:

**Supporting Photographs –
Capping Verification POS 2**

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Miller Homes

PROJECT:

Markfield Road, Ratby

TITLE:

Supporting Photographs –
Capping Verification POS 3

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NTS	FINAL
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7 - 11 Harding Street
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LE1 4DH

GRM Development Solutions

Laurus House
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Burton Upon Trent
DE14 2WH

Analytical Test Report: L23/05613/GRM - 23-37724

Your Project Reference:	P9347 Markfield Road, Ratby		
Your Order Number:	GRM/P9347	Samples Received / Instructed:	26/09/2023 / 26/09/2023
Report Issue Number:	1	Sample Tested:	26/09 to 09/10/2023
Samples Analysed:	6 soil samples	Report issued:	09/10/2023

Signed

James Gane
Analytical Services Manager
CTS Group

Notes:**General**

Please refer to Methodologies page for details pertaining to the analytical methods undertaken.

Samples will be retained for 14 days after issue of this report with the exception of the asbestos test portion which is held for 6 months unless otherwise requested.

Moisture Content was determined in accordance with CTS method statement MS - CL - Sample Prep, oven dried at <30°C.

Moisture Content is reported as a percentage of the dry mass of soil, this calculation is in accordance with BS1377, Part 2, 1990, Clause 3.2

Stone Content was determined in accordance with CTS method statement MS - CL - Sample Prep and refers to the percentage of stones retained on a 10mm BS test sieve.

Where specification limits are included these are for guidance only. Where a measured value has been highlighted this is not implying acceptance or failure and certainty of measurement values have not been taken into account.

Uncertainty of measurement values are available on request.

Samples were supplied by customer, results apply to the samples as received.

Asbestos

Please note: Where further analysis is required samples identified as containing asbestos are screened and tested on an as received basis. No correction is made for moisture content and these results are not covered by our accreditation

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

Deviating Samples

On receipt samples are compared against our sample holding and handling protocols, where any deviations have been noted these are reported on our deviating sample page (if present)

Accreditation Key

UKAS = UKAS Accreditation, MCERTS = MCERTS Accreditation, u = Unaccredited

MCERTS Accreditation only covers the SAND, CLAY and LOAM matrices

Date of Issue: 29.08.2023

Issued by: J. Gane

Issue No: 4

Rev No: 3



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LE1 4DH

L23/05613/GRM - 23-37724

Project Reference - P9347 Markfield Road, Ratby

Analytical Test Results - Soil

Lab Reference			316707	316708	316709	316710	316711	316712
Client Sample ID			POS 1	POS 2	POS 3	TS 1	TS 2	TS 3
Client Sample Location			Public Open Space	Public Open Space	Public Open Space	Stockpile	Stockpile	Stockpile
Client Sample Type			ES	ES	ES	ES	ES	ES
Client Sample Number			-	-	-	-	-	-
Depth - Top (m)			0.20	0.20	0.20	0.30	0.30	0.30
Depth - Bottom (m)			0.20	0.20	0.20	0.30	0.30	0.30
Date of Sampling			20/09/2023	20/09/2023	20/09/2023	20/09/2023	20/09/2023	20/09/2023
Time of Sampling			-	-	-	-	-	-
Sample Matrix			Other	Other	Clay	Clay	Clay	Clay
Determinant	Units	Accreditation						
Arsenic	(mg/kg)	MCERTS	< 10	< 10	< 10	< 10	< 10	< 10
Cadmium	(mg/kg)	MCERTS	0.6	0.6	0.6	0.7	0.6	0.7
Chromium (Total)	(mg/kg)	UKAS	17	17	16	17	16	16
Copper	(mg/kg)	MCERTS	22	20	20	21	20	20
Lead	(mg/kg)	MCERTS	29	29	30	29	29	30
Mercury	(mg/kg)	UKAS	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5
Nickel	(mg/kg)	MCERTS	17	16	16	16	15	15
Selenium	(mg/kg)	u	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
Zinc	(mg/kg)	MCERTS	58	58	58	63	61	61
Total Phenols	(mg/kg)	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cyanide (Total)	(mg/kg)	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chromium (Hexavalent)	(mg/kg)	u	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
pH	pH Units	MCERTS	8.4	8.1	8.0	7.9	8.0	7.9
Sulphate (Water soluble as SO ₄)	(mg/l)	u	54	25	12	100	220	140
Acenaphthene	(mg/kg)	MCERTS	< 0.20	< 0.02	< 0.02	< 0.20	< 0.20	0.35
Acenaphthylene	(mg/kg)	UKAS	< 0.20	< 0.02	< 0.02	< 0.20	< 0.20	< 0.20
Anthracene	(mg/kg)	UKAS	< 0.20	< 0.02	< 0.02	< 0.20	< 0.20	1.3
Benzo (a) anthracene	(mg/kg)	MCERTS	0.26	0.06	0.02	< 0.20	0.30	1.4
Benzo (a) pyrene	(mg/kg)	MCERTS	0.37	0.08	0.03	< 0.20	0.33	1.3
Benzo (b) fluoranthene	(mg/kg)	MCERTS	0.44	0.10	0.04	0.26	0.38	1.4
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	0.27	0.05	0.02	< 0.20	< 0.20	0.67
Benzo (k) fluoranthene	(mg/kg)	MCERTS	< 0.20	0.04	< 0.02	< 0.20	< 0.20	0.55
Chrysene	(mg/kg)	MCERTS	0.27	0.07	0.02	< 0.20	0.29	1.4
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	< 0.20	< 0.02	< 0.02	< 0.20	< 0.20	< 0.20
Fluoranthene	(mg/kg)	MCERTS	0.45	< 0.02	0.05	0.30	0.66	4.3
Fluorene	(mg/kg)	MCERTS	< 0.20	< 0.02	< 0.02	< 0.20	< 0.20	0.46
Indeno (1, 2, 3-cd) pyrene	(mg/kg)	MCERTS	0.28	0.06	0.02	< 0.20	< 0.20	0.69
Naphthalene	(mg/kg)	MCERTS	< 0.20	< 0.02	< 0.02	< 0.20	< 0.20	< 0.20
Phenanthrene	(mg/kg)	MCERTS	< 0.20	0.03	< 0.02	< 0.20	0.37	4.0
Pyrene	(mg/kg)	MCERTS	0.44	0.10	0.05	0.31	0.57	3.5
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	4.6	0.84	0.44	4.0	5.0	22
SOM (via TOC)	(%)	UKAS	2.7	2.7	2.5	2.5	2.6	2.4
Asbestos	-	UKAS	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected



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L23/05613/GRM - 23-37724

Project Reference - P9347 Markfield Road, Ratby

Analytical Test Results - TPH CWG

Lab Reference			316707	316708	316709	316710	316711	316712
Client Sample ID			POS 1	POS 2	POS 3	TS 1	TS 2	TS 3
Client Sample Location			Public Open Space	Public Open Space	Public Open Space	Stockpile	Stockpile	Stockpile
Client Sample Type			ES	ES	ES	ES	ES	ES
Client Sample Number			-	-	-	-	-	-
Depth - Top (m)			0.20	0.20	0.20	0.30	0.30	0.30
Depth - Bottom (m)			0.20	0.20	0.20	0.30	0.30	0.30
Date of Sampling			20/09/2023	20/09/2023	20/09/2023	20/09/2023	20/09/2023	20/09/2023
Time of Sampling			-	-	-	-	-	-
Sample Matrix			Other	Other	Clay	Clay	Clay	Clay
Determinant	Units	Accreditation						
Aliphatics								
>C ₅ to C ₆ [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
>C ₆ to C ₈ [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
>C ₈ to C ₁₀ [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
>C ₁₀ to C ₁₂ [EH_CU_1D_AL]	(mg/kg)	u	< 10	< 10	< 10	< 10	< 10	< 10
>C ₁₂ to C ₁₆ [EH_CU_1D_AL]	(mg/kg)	u	< 10	< 10	< 10	< 10	< 10	< 10
>C ₁₆ to C ₂₁ [EH_CU_1D_AL]	(mg/kg)	u	< 10	< 10	< 10	< 10	< 10	< 10
>C ₂₁ to C ₃₅ [EH_CU_1D_AL]	(mg/kg)	u	42	< 20	< 20	26	< 20	< 20
Aromatics								
>C ₅ to C ₇ [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
>C ₇ to C ₈ [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
>C ₈ to C ₁₀ [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
>C ₁₀ to C ₁₂ [EH_CU_1D_AR]	(mg/kg)	u	< 10	< 10	< 10	< 10	< 10	< 10
>C ₁₂ to C ₁₆ [EH_CU_1D_AR]	(mg/kg)	u	< 10	< 10	< 10	< 10	< 10	< 10
>C ₁₆ to C ₂₁ [EH_CU_1D_AR]	(mg/kg)	u	< 10	< 10	< 10	< 10	< 10	< 10
>C ₂₁ to C ₃₅ [EH_CU_1D_AR]	(mg/kg)	u	66	< 20	< 20	47	41	41
>C ₅ to C ₄₀ [EH_CU+HS_1D_Total]	(mg/kg)	u	170	< 50	< 50	100	66	67



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7 - 11 Harding Street
Leicester
LE1 4DH

L23/05613/GRM - 23-37724

Project Reference - P9347 Markfield Road, Ratby

Sample Descriptions

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Description	Moisture Content (%)	Stone Content (%)	Passing 2mm test sieve (%)
316707	POS 1	Public Open Space	ES	-	Brown gravelly clayey silt with occasional rootlets slag	12	12	64
316708	POS 2	Public Open Space	ES	-	Brown gravelly clayey silt with occasional organic matter slag	14	< 0.1	65
316709	POS 3	Public Open Space	ES	-	Brown gravelly sandy clay with occasional rootlets	13	< 0.1	74
316710	TS 1	Stockpile	ES	-	Brown gravelly sandy clay with rare rootlets	19	2.2	67
316711	TS 2	Stockpile	ES	-	Brown gravelly sandy clay with rare organic matter	17	18	47
316712	TS 3	Stockpile	ES	-	Brown gravelly sandy clay with rare rootlets	19	7.5	47



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7 - 11 Harding Street
Leicester
LE1 4DH

L23/05613/GRM - 23-37724

Project Reference - P9347 Markfield Road, Ratby

Sample Comments

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Comments
316707	POS 1	Public Open Space	ES	-	
316708	POS 2	Public Open Space	ES	-	VPH/BTEX - Sample taken from container with headspace.
316709	POS 3	Public Open Space	ES	-	
316710	TS 1	Stockpile	ES	-	
316711	TS 2	Stockpile	ES	-	
316712	TS 3	Stockpile	ES	-	



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7 - 11 Harding Street
Leicester
LE1 4DH

L23/05613/GRM - 23-37724

Project Reference - P9347 Markfield Road, Ratby

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preparation	Test Details
ANIONSS	MS - CL - Anions by Aquakem (2:1Extract)	Oven dried	Passing 2mm test sieve	Determination of Anions (inc Sulphate, chloride etc.) in soils by Aquakem. Analysis is based on a 2:1 water to soil extraction ratio
EPHS	MS - CL - EPH in Soil	As received	Passing 10mm test sieve	Determination of Extractable Petroleum Hydrocarbons in soils via GC-MS
PAHASRDS	MS - CL - PAH (As Received)	As received	Passing 10mm test sieve	Determination of Polyaromatic hydrocarbons in soil via GC-MS
CWGS	MS - CL - VPH & MS - CL - EPH	As received	Passing 10mm test sieve	Determination of TPH CWG (Volatile Petroleum Hydrocarbons and Extractable Petroleum Hydrocarbons) in soils via Headspace-GC-MS and GC-MS respectively
TOCS	MS - CL - TOC Eltra	Air Dried	Passing 10mm test sieve	Determination of Total Organic Carbon in soils
VPHS	MS - CL - VPH	As received	Passing 10mm test sieve	Determination of VPH in soils via Headspace-GC-MS
SKALARCNS	MS - CL - Cyanide by Skalar	As received	Passing 10mm test sieve	Determination of cyanide (total / free / complex) in soil using a Skalar segmented flow analyser
SKALARHCS	MS - CL - Hexavalent Chromium by Skalar	As received	Passing 10mm test sieve	Determination of hexavalent chromium in soil using Skalar segmented flow analyser
ICPMETS	MS - CL - ICP Metals	Air dried	Passing 10mm test sieve	Determination of metals in soils via ICP
PHS	MS - CL - pH in Soils	As received	Passing 10mm test sieve	Determination of pH in soils using a pH probe (using a 1:3 soil to water extraction)
SKALARPHS	MS - CL - Phenols by Skalar	As received	Passing 10mm test sieve	Determination of total phenols in soil using Skalar segmented flow analyser
ASB	MS - AS - Asbestos	-	-	Fibre identification is in accordance with in house documented methods which are based on the procedure documented in the HSE Document HSG 248 "Asbestos: The analysts guide for sampling, analysis and clearance procedures"
SAMPLEPREP	MS - CL - Sample Preparation	-	-	Preparation of samples (including determination of moisture content) to allow for subsequent analysis



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7 - 11 Harding Street
Leicester
LE1 4DH

L23/05613/GRM - 23-37724

Project Reference - P9347 Markfield Road, Ratby

Sample Deviations

Deviations are listed below against each sample and associated test method, where deviation(s) are noted it means data may not be representative of the sample at the time of sampling and it is possible that results provided may be compromised.

Observations on receipt

A - No date of sampling provided

C - Received in inappropriate container

H - Contains headspace

T - Temperature on receipt exceeds storage temperature

R - Sample(s) received with less than 96 hours for testing to commence/complete, any result formally classed as deviating will be marked with an X against the applicable test (i.e. RX)

Observations whilst in laboratory

X - Exceeds sampling to extraction or analysis timescales

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Test	Deviations
316707	POS 1	Public Open Space	ES	-	MS - CL - VPH	R
316707	POS 1	Public Open Space	ES	-	MS - CL - pH in Soils	R
316708	POS 2	Public Open Space	ES	-	MS - CL - VPH	R
316708	POS 2	Public Open Space	ES	-	MS - CL - pH in Soils	R
316709	POS 3	Public Open Space	ES	-	MS - CL - VPH	R
316709	POS 3	Public Open Space	ES	-	MS - CL - pH in Soils	R
316710	TS 1	Stockpile	ES	-	MS - CL - VPH	R
316710	TS 1	Stockpile	ES	-	MS - CL - pH in Soils	R
316711	TS 2	Stockpile	ES	-	MS - CL - VPH	R
316711	TS 2	Stockpile	ES	-	MS - CL - pH in Soils	R
316712	TS 3	Stockpile	ES	-	MS - CL - VPH	R
316712	TS 3	Stockpile	ES	-	MS - CL - pH in Soils	R



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7 - 11 Harding Street
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L23/05613/GRM - 23-37724

Project Reference - P9347 Markfield Road, Ratby

HWOL TPH Acronym Index

Acronym	Description
HS	Headspace Analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics and Aromatics
AL	Aliphatics Only
AR	Aromatics Only
2D	GC-GC - Double Coil Gas Chromatography
#1	EH_Total but with humics mathmatically subtracted
#2	EH_Total but with fatty acids mathmatically subtracted
_	Operator - underscore to separate acronyms (except for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry

	GRM TIER 1 ASSESSMENT CRITERIA		
LAND USE	Residential with Plant Uptake		
CONTAMINANT	1%	2.50%	6%
^a Arsenic	37	37	37
^a Cadmium	22	22	22
^b Chromium III	910	910	910
^a Chromium VI	21	21	21
^a Lead	200	200	200
^{b/c} Mercury	40	40	40
^b Selenium	250	250	250
^b Nickel	180	180	180
^b Phenols	280	550	1100
^b Copper	2400	2400	2400
^b Zinc	3700	3700	3700
^d Cyanide	34	34	34
^a Benzene	0.20	0.33	0.87
^b Toluene	130	290	660
^b Ethylbenzene	47	110	260
^b <i>o</i> - xylene	60	140	330
^b <i>m</i> - xylene	59	140	320
^b <i>p</i> - xylene	56	130	310
Non Genotoxic PAHs			
^b Acenaphthene	210	510	1100
^b Acenaphthylene	170	420	920
^b Anthracene	2400	5400	11000
^b Fluoranthene	280	560	890
^b Fluorene	170	400	860
^b Naphthalene	2.3	5.6	13
^b Phenanthrene	95	220	440
^b Pyrene	620	1200	2000
Genotoxic PAHs			
^{a/e} Benzo(a)pyrene	5	5	5
ALIPHATIC HYDROCARBONS			
^b C5-C6	42	78	160
^b C6-C8	100	230	530
^b C8-C10	27	65	150
^b C10-C12	130	330	760
^b C12-C16	1100	2400	4300
^b C16-35	65000	92000	110000
AROMATIC HYDROCARBONS			
^b C5-7 (benzene)	70	140	300
^b C7-8 (toluene)	130	290	660
^b C8-C10	34	83	190
^b C10-C12	74	180	380
^b C12-C16	140	330	660
^b C16-C21	260	540	930
^b C21-C35	1100	1500	1700

Notes

- a C4SL - SP1010 (2014) - Benzene and Benzo(a)pyrene values for 1% and 2.5% SOM have been calculated using default C4SL parameters in CLEA v1.07
- b LQM/CIEH S4UL values (2015).
- c S4UL for inorganic Hg used.
- d Atkins ATRISKsoil Value
- e Benzo(a)pyrene is a surrogate marker for the 8 genotoxic PAHs (Benzo(a)pyrene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(ghi)perylene, Benzo(k)fluoranthene, Chrysene, Dibenzo(ah)anthracene, Ideno(1,2,3-cd)pyrene)

GRM TAC 11-2016

	GRM TIER 1 ASSESSMENT CRITERIA		
LAND USE	Public Open Space 1 (residential)		
CONTAMINANT	1%	2.50%	6%
^e Arsenic	79	79	79
^e Cadmium	220	220	220
^b Chromium III	1500	1500	1500
^e Chromium VI	23	23	23
^e Lead	630	630	630
^{b/c} Mercury	120	120	120
^b Selenium	1100	1100	1100
^b Nickel	230	230	230
^b Phenols	760	1500	3200
^b Copper	12000	12000	12000
^b Zinc	81000	81000	81000
^d Cyanide	34	34	34
^b Benzene	140	140	140
^b Toluene	56000	56000	56000
^b Ethylbenzene	24000	24000	25000
^b <i>o</i> - xylene	41000	42000	43000
^b <i>m</i> - xylene	41000	42000	43000
^b <i>p</i> - xylene	41000	42000	43000
Non Genotoxic PAHs			
^b Acenaphthene	15000	15000	15000
^b Acenaphthylene	15000	15000	15000
^b Anthracene	74000	74000	74000
^b Fluoranthene	3100	3100	3100
^b Fluorene	9900	9900	9900
^b Naphthalene	4900	4900	4900
^b Phenanthrene	3100	3100	3100
^b Pyrene	7400	7400	7400
Genotoxic PAHs			
^{a/e} Benzo(a)pyrene	10	10	10
ALIPHATIC HYDROCARBONS			
^b C5-C6	570000	590000	600000
^b C6-C8	600000	610000	620000
^b C8-C10	13000	13000	13000
^b C10-C12	13000	13000	13000
^b C12-C16	13000	13000	13000
^b C16-35	250000	250000	250000
AROMATIC HYDROCARBONS			
^b C5-7 (benzene)	56000	56000	56000
^b C7-8 (toluene)	56000	56000	56000
^b C8-C10	5000	5000	5000
^b C10-C12	5000	5000	5000
^b C12-C16	5100	5100	5000
^b C16-C21	3800	3800	3800
^b C21-C35			

Notes

- C4SL - SP1010 (2014) - Benzene and Benzo(a)pyrene values for 1% and 2.5% SOM have been calculated using default C4SL parameters in CLEA v1.07
- LQM/CIEH S4UL values (2015).
- S4UL for inorganic Hg used.
- Atkins ATRISKsoil Value
- Benzo(a)pyrene is a surrogate marker for the 8 genotoxic PAHs (Benzo(a)pyrene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(ghi)perylene, Benzo(k)fluoranthene, Chrysene, Dibenzo(ah)anthracene, Ideno(1,2,3-cd)pyrene)

GRM TAC 11-2016



A P P E N D I X D

Land Appraisal | Environmental | Geotechnical | Design | Mining | Inspections

GRM Development Solutions Limited, Laurus House, First Avenue, Centrum 100, Burton upon Trent, Staffs DE14 2WH
www.grm-uk.com | info@grm-uk.com | 01283 551249 Company No. 3099018 (England), VAT Reg. No. 658 1005 48

P9347 Markfield Road, Ratby
Trial Pitting Field Notes 18/10/2023

Plot 138

0.00– 0.15: Dark brown sandy topsoil (re-laid topsoil).

0.15 – 1.00: Brown, locally dark brown, sandy slightly gravelly clay (disturbed natural ground).

Plot 139

0.00 – 0.20: Dark brown sandy topsoil (re-laid topsoil).

0.20 – 0.50: Yellow brown gravel and cobbles of limestone (clean imported stone).

0.50 – 1.0: Brown sandy slightly gravelly clay (natural ground).

Plot 141

0.00 – 0.20: Dark brown sandy topsoil (re-laid topsoil).

0.20 – 1.0: Brown sandy slightly gravelly clay (natural ground).

Plot 142

0.0 – 1.00: Brown sandy silty slightly gravelly clay with whole bricks (made ground).

Plot 143

0.00 – 1.00: Brown sandy silty slightly gravelly clay with whole bricks (made ground).

Plot 144

0.00 – 1.00: Brown sandy silty slightly gravelly clay with whole bricks (made ground).

Plot 145

0.00– 0.15: Dark brown sandy topsoil (re-laid topsoil).

0.15 – 1.00: Brown sandy slightly gravelly clay (natural ground).

Matthew Tomkins



4161



7 - 11 Harding Street
Leicester
LE1 4DH

GRM Development Solutions

Laurus House
First Avenue
Centrum 100
Burton Upon Trent
DE14 2WH

Analytical Test Report: L23/06276/GRM - 23-38425

Your Project Reference:	P9347 Markfield Road, Ratby		
Your Order Number:	P9347	Samples Received / Instructed:	18/10/2023 / 18/10/2023
Report Issue Number:	1	Sample Tested:	18/10 to 23/10/2023
Samples Analysed:	3 soil samples	Report issued:	23/10/2023

Signed

James Gane
Analytical Services Manager
CTS Group

Notes:**General**

Please refer to Methodologies page for details pertaining to the analytical methods undertaken.

Samples will be retained for 14 days after issue of this report with the exception of the asbestos test portion which is held for 6 months unless otherwise requested.

Moisture Content was determined in accordance with CTS method statement MS - CL - Sample Prep, oven dried at <30°C.

Moisture Content is reported as a percentage of the dry mass of soil, this calculation is in accordance with BS1377, Part 2, 1990, Clause 3.2

Stone Content was determined in accordance with CTS method statement MS - CL - Sample Prep and refers to the percentage of stones retained on a 10mm BS test sieve.

Where specification limits are included these are for guidance only. Where a measured value has been highlighted this is not implying acceptance or failure and certainty of measurement values have not been taken into account.

Uncertainty of measurement values are available on request.

Samples were supplied by customer, results apply to the samples as received.

Asbestos

Please note: Where further analysis is required samples identified as containing asbestos are screened and tested on an as received basis. No correction is made for moisture content and these results are not covered by our accreditation

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

Deviating Samples

On receipt samples are compared against our sample holding and handling protocols, where any deviations have been noted these are reported on our deviating sample page (if present)

Accreditation Key

UKAS = UKAS Accreditation, MCERTS = MCERTS Accreditation, u = Unaccredited

MCERTS Accreditation only covers the SAND, CLAY and LOAM matrices

Date of Issue: 10.10.2023

Issued by: J. Gane

Issue No: 4

Rev No: 4



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7 - 11 Harding Street
Leicester
LE1 4DH

L23/06276/GRM - 23-38425

Project Reference - P9347 Markfield Road, Ratby

Analytical Test Results - Solid

Lab Reference			321338	321339	321340
Client Sample ID			-	-	-
Client Sample Location			Plot 142	Plot 143	Plot 144
Client Sample Type			-	-	-
Client Sample Number			-	-	-
Depth - Top (m)			0.30	0.30	0.30
Depth - Bottom (m)			0.30	0.30	0.30
Date of Sampling			18/10/2023	18/10/2023	18/10/2023
Time of Sampling			-	-	-
Sample Matrix			Clay	Clay	Clay
Determinant	Units	Accreditation			
Arsenic	(mg/kg)	MCERTS	< 10	< 10	< 10
Cadmium	(mg/kg)	MCERTS	1.1	1.0	0.9
Chromium (Total)	(mg/kg)	UKAS	21	25	17
Copper	(mg/kg)	MCERTS	37	26	27
Lead	(mg/kg)	MCERTS	34	32	37
Mercury	(mg/kg)	UKAS	< 2.5	< 2.5	< 2.5
Nickel	(mg/kg)	MCERTS	33	30	20
Selenium	(mg/kg)	u	< 8.0	< 8.0	< 8.0
Zinc	(mg/kg)	MCERTS	110	76	80
Total Phenols	(mg/kg)	MCERTS	< 1.0	< 1.0	< 1.0
Cyanide (Total)	(mg/kg)	MCERTS	< 1.0	< 1.0	< 1.0
Chromium (Hexavalent)	(mg/kg)	u	< 1.0	< 1.0	< 1.0
pH	pH Units	MCERTS	8.1	8.0	7.8
Sulphate (Water soluble as SO ₄)	(mg/l)	u	180	150	160
Acenaphthene	(mg/kg)	MCERTS	< 0.02	< 0.02	1.6
Acenaphthylene	(mg/kg)	UKAS	< 0.02	< 0.02	< 0.20
Anthracene	(mg/kg)	UKAS	< 0.02	< 0.02	2.6
Benzo (a) anthracene	(mg/kg)	MCERTS	0.02	< 0.02	3.8
Benzo (a) pyrene	(mg/kg)	MCERTS	0.02	< 0.02	3.2
Benzo (b) fluoranthene	(mg/kg)	MCERTS	0.03	< 0.02	4.5
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	< 0.02	< 0.02	2.1
Benzo (k) fluoranthene	(mg/kg)	MCERTS	< 0.02	< 0.02	1.6
Chrysene	(mg/kg)	MCERTS	< 0.02	< 0.02	3.7
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	< 0.02	< 0.02	0.29
Fluoranthene	(mg/kg)	MCERTS	0.04	0.03	10
Fluorene	(mg/kg)	MCERTS	< 0.02	< 0.02	1.1
Indeno (1, 2, 3,-cd) pyrene	(mg/kg)	MCERTS	< 0.02	< 0.02	2.4
Naphthalene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.20
Phenanthrene	(mg/kg)	MCERTS	< 0.02	< 0.02	9.3
Pyrene	(mg/kg)	MCERTS	0.04	0.03	8.6
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	0.41	0.37	55
SOM (via TOC)	(%)	UKAS	< 1.7	< 1.7	2.4
Asbestos	-	UKAS	No asbestos detected	No asbestos detected	No asbestos detected



4161



7 - 11 Harding Street
Leicester
LE1 4DH

L23/06276/GRM - 23-38425

Project Reference - P9347 Markfield Road, Ratby

Sample Descriptions

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Description	Moisture Content (%)	Stone Content (%)	Passing 2mm test sieve (%)
321338	-	Plot 142	-	-	Brown gravelly slightly sandy silty clay	14	13	48
321339	-	Plot 143	-	-	Brown gravelly slightly sandy silty clay	15	< 0.1	55
321340	-	Plot 144	-	-	Brown gravelly slightly sandy silty clay	18	2.0	71



4161



7 - 11 Harding Street
Leicester
LE1 4DH

L23/06276/GRM - 23-38425

Project Reference - P9347 Markfield Road, Ratby

Sample Comments

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Comments
321338	-	Plot 142	-	-	
321339	-	Plot 143	-	-	
321340	-	Plot 144	-	-	



4161



7 - 11 Harding Street
Leicester
LE1 4DH

L23/06276/GRM - 23-38425

Project Reference - P9347 Markfield Road, Ratby

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preparation	Test Details
ANIONSS	MS - CL - Anions by Aquakem (2:1Extract)	Oven dried	Passing 2mm test sieve	Determination of Anions (inc Sulphate, chloride etc.) in soils by Aquakem. Analysis is based on a 2:1 water to soil extraction ratio
PAHASRDS	MS - CL - PAH (As Received)	As received	Passing 10mm test sieve	Determination of Polyaromatic hydrocarbons in soil via GC-MS
TOCS	MS - CL - TOC Eltra	Air Dried	Passing 10mm test sieve	Determination of Total Organic Carbon in soils
SKALARCNS	MS - CL - Cyanide by Skalar	As received	Passing 10mm test sieve	Determination of cyanide (total / free / complex) in soil using a Skalar segmented flow analyser
SKALARHCS	MS - CL - Hexavalent Chromium by Skalar	As received	Passing 10mm test sieve	Determination of hexavalent chromium in soil using Skalar segmented flow analyser
ICPMETS	MS - CL - ICP Metals	Air dried	Passing 10mm test sieve	Determination of metals in soils via ICP
PHS	MS - CL - pH in Soils	As received	Passing 10mm test sieve	Determination of pH in soils using a pH probe (using a 1:3 soil to water extraction)
SKALARPHS	MS - CL - Phenols by Skalar	As received	Passing 10mm test sieve	Determination of total phenols in soil using Skalar segmented flow analyser
ASB	MS - AS - Asbestos	-	-	Fibre identification is in accordance with in house documented methods which are based on the procedure documented in the HSE Document HSG 248 "Asbestos: The analysts guide for sampling, analysis and clearance procedures"
SAMPLEPREP	MS - CL - Sample Preparation	-	-	Preparation of samples (including determination of moisture content) to allow for subsequent analysis

	GRM TIER 1 ASSESSMENT CRITERIA		
LAND USE	Residential with Plant Uptake		
CONTAMINANT	1%	2.50%	6%
^a Arsenic	37	37	37
^a Cadmium	22	22	22
^b Chromium III	910	910	910
^a Chromium VI	21	21	21
^a Lead	200	200	200
^{b/c} Mercury	40	40	40
^b Selenium	250	250	250
^b Nickel	180	180	180
^b Phenols	280	550	1100
^b Copper	2400	2400	2400
^b Zinc	3700	3700	3700
^d Cyanide	34	34	34
^a Benzene	0.20	0.33	0.87
^b Toluene	130	290	660
^b Ethylbenzene	47	110	260
^b <i>o</i> - xylene	60	140	330
^b <i>m</i> - xylene	59	140	320
^b <i>p</i> - xylene	56	130	310
Non Genotoxic PAHs			
^b Acenaphthene	210	510	1100
^b Acenaphthylene	170	420	920
^b Anthracene	2400	5400	11000
^b Fluoranthene	280	560	890
^b Fluorene	170	400	860
^b Naphthalene	2.3	5.6	13
^b Phenanthrene	95	220	440
^b Pyrene	620	1200	2000
Genotoxic PAHs			
^{a/e} Benzo(a)pyrene	5	5	5
ALIPHATIC HYDROCARBONS			
^b C5-C6	42	78	160
^b C6-C8	100	230	530
^b C8-C10	27	65	150
^b C10-C12	130	330	760
^b C12-C16	1100	2400	4300
^b C16-35	65000	92000	110000
AROMATIC HYDROCARBONS			
^b C5-7 (benzene)	70	140	300
^b C7-8 (toluene)	130	290	660
^b C8-C10	34	83	190
^b C10-C12	74	180	380
^b C12-C16	140	330	660
^b C16-C21	260	540	930
^b C21-C35	1100	1500	1700

Notes

- a C4SL - SP1010 (2014) - Benzene and Benzo(a)pyrene values for 1% and 2.5% SOM have been calculated using default C4SL parameters in CLEA v1.07
- b LQM/CIEH S4UL values (2015).
- c S4UL for inorganic Hg used.
- d Atkins ATRISKsoil Value
- e Benzo(a)pyrene is a surrogate marker for the 8 genotoxic PAHs (Benzo(a)pyrene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(ghi)perylene, Benzo(k)fluoranthene, Chrysene, Dibenzo(ah)anthracene, Ideno(1,2,3-cd)pyrene)

GRM TAC 11-2016



A P P E N D I X E

Land Appraisal | Environmental | Geotechnical | Design | Mining | Inspections

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DO NOT SCALE

NOTES:



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CLIENT:

Miller Homes

PROJECT:

Markfield Road, Ratby

TITLE:

**Supporting Photographs –
Capping Verification Eastern
POS 1**

SCALE@SIZE:	ISSUE:
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**Supporting Photographs –
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POS 2**

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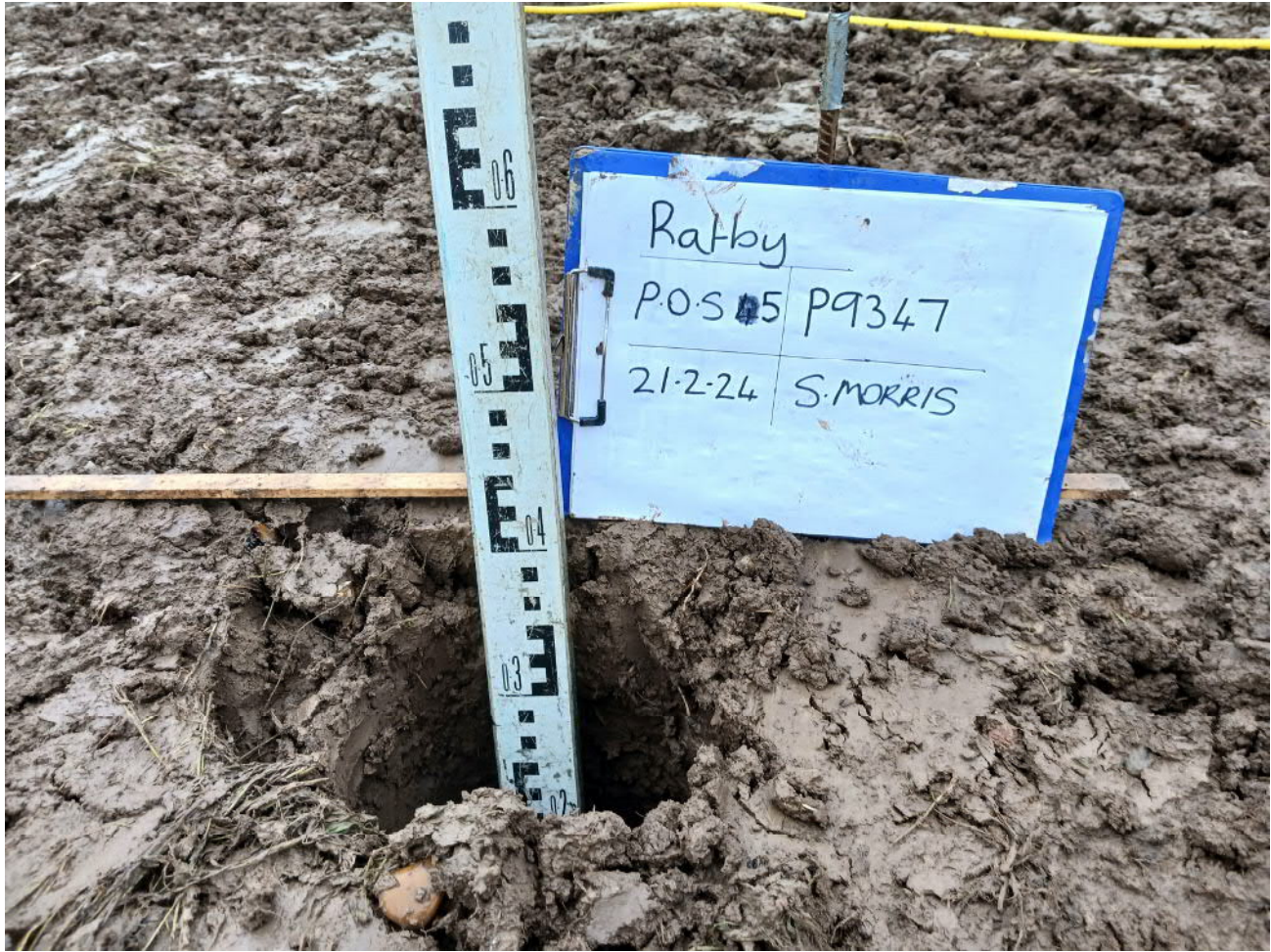
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Supporting Photographs – Capping Verification Eastern POS 5	
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NTS	FINAL
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P9347	14