



LYCHGATE LANE, BURBAGE, LEICESTERSHIRE

PHASE II SITE APPRAISAL
FOR
AVANT HOMES (MIDLANDS)

Project Ref:
P10481/PIISAR.1

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Prepared for:
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This report has been prepared in accordance with GRM's Accredited Quality Procedures

If you have any queries regarding this report please contact the project manager in the first instance.

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Issue	Description of Revision	Signature



Site Appraisal for Lychgate Lane, Burbage, Leicestershire

SUMMARY OF RECOMMENDATIONS

Where further assessment is required it is indicated with a "Y" in the right hand column.		
Proposed Development	Residential properties with associated private gardens, soft landscaping areas and infrastructure.	
CONTAMINATION ASSESSMENT - REMEDIATION / WASTE DISPOSAL		
End Users	No remediation required.	
Site Workers	No remediation required.	
Construction Materials	Appropriate concrete specification. PE water supply pipes required (to be confirmed by water company).	Y
Groundwater	No remediation required.	
Surface Water	No remediation required.	
Waste Disposal	Preliminary Waste Classification: Non-Hazardous for topsoil & natural strata. Assumed Inert for natural strata. Will need to be confirmed by receiving landfill.	Y
GEOTECHNICAL ASSESSMENT – FOUNDATIONS		
Ground Treatment Required	None required at this stage. For pile foundations, safe working platform would be required – piling matt in the region of 400mm thick likely (if constructed without reinforcement depending on the quality of any earthworks). Existing sewers will need grubbing out and backfilling, or grouting, where they are not being retained within the new development.	Y
Main Bearing Strata	Firm to stiff slightly sandy slightly gravelly CLAY.	
Nett Allowable Bearing Pressure	For trench fill - 110kN/m ² (natural cohesive strata). For piles (if required) – safe working load to be confirmed by piling contractor.	Y
Rockhead	Not encountered.	
Tree Influence	Yes.	
Volume Change Potential	Medium.	
Likely Foundation Types	Trench Fill or CFA foundations (if piles required).	Y
Likely Foundation Depth Range	For trench fill – 0.90m to >2.5m begl (due to deepening for trees). For piles – to be confirmed by piling contractor for piles.	Y
Excavation Hazards	Shallow excavations should generally be stable. Granular soils, where present as thin layers, are liable to collapse without warning. Shallow perched groundwater should be expected.	
Floor Slab Types	100% suspended floor slabs required at this stage until a development layout plan and final site levels are confirmed – voided floor slabs (beam and block) will be required where there is tree influence. (To be reviewed on completion of gas monitoring programme).	Y
Gas Protection Requirements Radon and/or Landfill	Gas protection measures (for methane and carbon dioxide) are not currently required - to be confirmed when gas monitoring is completed. No radon gas protection measures are required.	Y
GEOTECHNICAL ASSESSMENT - GENERAL		
Slope Stability Risk	Negligible.	
Soakaways Potential	Not suitable.	
New Access Roads	Observational CBRs 3% to 5% in natural cohesive soils. Insitu CBR testing is recommended immediately prior to road construction.	
Buried Concrete Class	DS - 1 / AC – 1s. GEN-1 (unreinforced); RC35 concrete (reinforced).	
Retaining Walls and Boundary Features	No retaining walls present. Lychgate Lane, residential housing, fields and a farm, form the site boundaries.	

Further Assessment Targets	Review requirement for gas protection measures on completion of monitoring programme. Once a detailed development layout is available (along with a completed tree survey report and final site levels), a budgetary foundation schedule can be produced. If piles are required, cable percussion or rotary boreholes will be needed for pile design.	Y
Other Comments	Tree survey report should be conducted; liaison with Local Water Supply Company to determine the appropriate water supply pipes at the site.	

This summary is based on the full report that provides the detailed assessment of the ground risks affecting the development and how to manage them. It should not be used in isolation.

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1 INTRODUCTION

1.1 PREAMBLE

GRM Development Solutions Limited (GRM) has been appointed by Avant Homes Midlands (Client), to undertake a Phase II Site Appraisal for land off 'Lychgate Lane, Burbage, Leicestershire'.

A previous Phase 1 Geo-environmental desk study report has been undertaken by Rodgers Leask (Ref: 21214-RLL-21-XX-RP-O-0002, dated October 2021) and this formed Phase I of the assessment and allowed the geotechnical and geo-environmental setting of the site to be determined.

The Phase II works reported within this document comprised an intrusive ground investigation of window sample boreholes, trial pits, and soakaway pits, and included geotechnical soil testing, chemical soil analysis and gas monitoring. The information gained from the Phase II works will be used to refine the conceptual model for the site and determine the most cost-effective development solutions.

This document is intended to provide information that will assist decision making by identifying and recommending solutions to ground engineering and contamination issues.

GRM Standard Limitations of Reporting are provided in Appendix A of this report.

The Client proposes to develop the site with a number of residential properties with associated private gardens / soft landscaping, along with an area of public open space / play area, access roads, an attenuation pond and infrastructure. The proposed development layout provided by the Client, on which this report is based, is presented in Appendix B.

The Client has informed GRM of the following potential development hazards:

- There are a number of existing sewers crossing the site area, with visual evidence on the ground surface suggesting that some have become disused (across the eastern side of the site).
- There are some underground electricity cables at the north western and eastern corners of the site.
- There are some overhead electricity cables across the middle of the site area.

1.2 OBJECTIVES OF THE SITE APPRAISAL

The principal aims of the Phase II Site Appraisal are as follows:

- a) Obtain information, from easily accessible sources, about the soil and groundwater conditions within the area of the site.
- b) Determine the possible ground-related geotechnical and contamination hazards within the site boundaries that may affect the proposed development.

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- c) Provide preliminary development recommendations.
- d) Provide advice on further works required for the cost-effective reduction of risks to the development and procedures likely to satisfy regulators.

Whilst every effort has been made to pre-empt the likely requirements of the Local Authority and the Environment Agency, they are likely to have specific requirements that will need to be discussed and addressed at a later date.

2 PHASE I DESK STUDY SUMMARY

Project Name.	Land off Lychgate Lane, Burbage.
Project Reference.	P10481.
Client.	Avant Homes (Midlands).
Site Location (address).	Lychgate Lane, Burbage, Leicestershire, LE10 2DR.
National Grid Reference.	SP 449923.
Site Area (Ha).	2.74 Ha.
Summary of Proposed Development.	Residential housing with associated private gardens / soft landscaping, along with an area of public open space / play area, access roads, an attenuation pond and infrastructure.
Client Supplied Information.	- Ø Site location plan. - Ø Proposed development masterplan. - Ø Constraints plan. - Ø Severn Trent drainage records. - Ø Rodgers Leask Phase 1 Geo-environmental desk study report.
Site Setting.	The site area has a triangular outline and comprises of a single grass field (used for animal grazing), with no buildings or hardstanding. There are overhead lines running through the centre of the site (east-west). Hedgerows and mature trees border the entire site area. The northern boundary is formed by Lychgate Lane, the western boundary is formed by residential housing and fields, the southern boundary is formed by further fields and the eastern boundary is formed by a farm with associated buildings. The topography of the site is generally flat-lying, but with gentle sloping ground (downwards) from west to east. Utility services included electricity cables (underground and overhead lines), and a number of sewers.
Site History.	The site area has remained unchanged as a field since the earliest maps reviewed (1886). The surrounding area has predominantly comprised agricultural land throughout mapped history, with residential housing associated with Burbage village extending to the sites western boundary. Lychgate Farm adjacent to the sites eastern boundary has been present throughout mapped history. There has been limited industry in the surrounding area including a sewage disposal works (now a

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	pumping station), smithy, old brick kiln, brick works and hosiery factory; none of these are likely to have had an impact on the site directly.
Geology.	No made ground mapped within the site, and none is expected. Topsoil should be present throughout. Superficial deposits comprising Bosworth Clay Member (clay and silt) are recorded across the site area. Solid geology of the Mercia Mudstone Group (mudstone weathering to clay) recorded across the whole of the site area.
Hydrogeology.	The Environment Agency has classified the superficial deposits as unproductive strata, whilst the underlying bedrock is classified as a Secondary B Aquifer (Mercia Mudstone). There are two groundwater abstraction licenses recorded within 500m of the site, but no recorded potable water abstractions within 1km. The site is not recorded to be within a Groundwater Source Protection Zone.
Hydrology.	The only surface water feature within 250m of the site is a lake located to the south east; this will not be impacted by the site. There are no surface water abstraction licenses recorded within 500m of the site. There are no pollution incidents recorded within 500m of the site.
Flooding.	The site is not recorded to be in an area at risk from flooding by rivers or the sea and is not recorded to be within an area at risk from surface water flooding. Based upon the anticipated ground conditions (and the local conditions) it is considered that groundwater flooding is not a potential issue within the site area itself. A Phase II ground investigation would provide information on the local groundwater regime so that the risk can be assessed by the project's infrastructure engineer. Any risk associated with the groundwater regime should be catered for within the development infrastructure design.
Mining.	The site is not at risk from historic coal mining. GRM have conducted an on-line search, which has shown that the Oil and Gas Authority does not record the site to be within an on-shore licence area or on-shore Hydrocarbon Field or a Shale Prospecting Area.

Quarrying.	From the historical mapping, there has been no evidence of any quarrying activities within close proximity of the site area.
Environmental Information.	There are no active or historical landfills / waste sites recorded within 250m of the site. There are three licensed discharge consents recorded within 250m of the site associated with sewer storm overflow at Lychgate Farm and the pumping station to the south of the site.
Potential Soil Contamination Sources.	Apart from agricultural usage (grazing), there are no site specific contaminants of concern.
Potential Ground Gas Sources (including Radon).	No viable sources of ground gas have been identified at this stage. However, precautionary gas monitoring should be conducted. The site has been assessed following the guidelines in 'Radon: guidance on protective measures for new dwellings' (BR211 Revised 2023). The site is not within an area recorded to require radon gas protection measures.

2.1 PHASE I CONCEPTUAL SITE MODEL

HUMAN HEALTH			
Source	Pathway	Receptor	Level of Risk
Agricultural land use (grazing) – no source identified.	Indoor and outdoor inhalation of soil dust; the ingestion of, and dermal contact with, contaminated soil and soil dust; ingestion of vegetables that have taken up contamination and contaminated soil attached to vegetables.	End users.	Very Low.
		Construction and Maintenance Workers.	
No gas source identified.	Inhalation of ground gas.	End users.	Very Low.
Agricultural land use (grazing) – no source identified.	Migration of contamination through leaks and joints, degradation of pipe materials.	Water supply pipes.	Very Low.

CONTROLLED WATERS			
Agricultural land use (grazing) – no source identified.	Leaching of contaminants and vertical migration to the groundwater.	Unproductive strata (Superficial Deposits) / Secondary B Aquifer (Mercia Mudstone).	Negligible.

3 PHASE II GROUND INVESTIGATION

3.1 FIELDWORK

The ground investigation has been designed in accordance with the general comments outlined in Appendix A (iv).

The ground investigation fieldwork was conducted on the 4th and 5th January 2024, with groundwater/gas monitoring visits continuing after that period. A total of sixteen exploratory holes (six window sample boreholes, seven trial pits and three soakaway pits) were progressed, to a maximum depth of 4.0m below existing ground level (begl). The exploratory hole location plan is presented in Appendix D, whilst the exploratory hole logs are presented in Appendix E.

The exploratory holes were positioned to provide an adequate coverage of the site where the new residential properties are proposed to be located, and to provide information with regard to the ground conditions. The location of the exploratory holes was governed by the presence of a number of utility services, including various sewers and both underground and overhead electricity cables.

Six gas and groundwater monitoring standpipes were installed during the site works. The rationale for these works is discussed fully in Section 6. A Gas Monitoring Plan, illustrating the locations of the standpipes is presented in Appendix F. The standpipes will need to remain in place until around mid-March 2024.

Samples not used for testing will be stored for a month after issue of this report and then disposed of, unless the Client requests in writing that they be kept.

3.2 PROVEN GROUND

The following ground conditions were encountered during the investigation fieldwork:

- Topsoil
- Bosworth Clay Member (Superficial Deposits)

3.2.1 Topsoil

Topsoil (and underlying subsoil) was encountered from the ground surface in all the completed exploratory holes. The topsoil ranged in thickness from 0.2m to 0.38m, with a general thickness of 0.3m.

The topsoil typically comprised:

- Dark brown, slightly sandy, slightly gravelly, CLAY. Gravel is fine to coarse, subangular to subrounded, of quartzite and mudstone.

3.2.2 Bosworth Clay Member

The Bosworth Clay Member was encountered in all the exploratory holes undertaken across the site. The full thickness of these deposits was not proven.

The deposits generally comprised:

- Firm to stiff (medium to high strength), orange brown mottled light grey / light yellowish brown / dark brown, slightly sandy slightly gravelly CLAY. Gravel is fine to coarse, subangular to subrounded of mudstone and sandstone, with rare quartzite, chalk and chert. Rare cobbles. Pockets of clayey or gravelly sand and sandy clay. These strata are predominantly encountered throughout the site.
- Medium dense, orangish brown / dark brown, slightly clayey (occasionally slightly gravelly) fine to medium SAND. Strata is wet. Encountered in WS02 (0.9-1.0m), WS04 (1.9-2.2m & 3.0-3.2m), WS06 (1.5-2.4m & 3.1-3.5m) and TP09 (1.6-1.85m). These strata are only encountered intermittently.

Hand shear vane measurements in the cohesive strata recorded shear strengths generally between 65kPa and 100kPa, but locally as low as 40kPa and as high as 120kPa. Lower values are typically recorded in the top 1.2m and are more prevalent in the east of the site.

Standard Penetration Test N-values are tabulated below:

Depth (No of readings)	Range in SPT 'N' Value	Correlation to strength *
1.0m (6)	11 to 14	Medium *
2.0m (6)	8 to 21	Medium to High * or Medium Dense
3.0m (6)	10 to 28	Medium to High * or Medium Dense
4.0m (6)	17 to 26	High *

*Utilising the empirical relationship formulated by Stroud (1974) where undrained shear strength is related to SPT N-values and a factor based on plasticity.

3.3 CONTAMINATION OBSERVATIONS

No visual evidence of potential contamination was encountered within the natural strata.

No visual or olfactory evidence of petroleum hydrocarbon contamination was encountered during the fieldwork.

3.4 GROUNDWATER OBSERVATIONS

Slight seepages of perched groundwater or damp / wet strata were recorded within rare sand pockets, within the Bosworth Clay Member.

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Additional groundwater ingresses were recorded in the following exploratory holes, as detailed below:

	Depth	Description of groundwater and strata affected
TP09	1.6-1.85m begl	Perched groundwater within band of sand (Bosworth Clay Member)
WS04	1.9-2.2m begl and 3.0-3.2m begl	Perched groundwater within bands of sand (Bosworth Clay Member)
WS06	1.5-2.4m begl and 3.1-3.5m begl	Perched groundwater within bands of sand (Bosworth Clay Member)

Two groundwater monitoring visits have been conducted at this stage and the results of the monitoring are reported in Appendix G. In summary, standing water was recorded in each of the installations, varying between 0.3m and 2.8m begl, over the course of the two monitoring visits.

It should be noted that the majority of the response zones in the installations were recorded as being 'flooded'. It is believed that the installations are acting as 'sump holes' for groundwater from the sand layers and shallow surface water ingress (due to persistent rain), and the levels recorded are not a true reflection of shallow groundwater.

Long term monitoring of groundwater levels has not been conducted as part of this investigation and interpreted levels are approximate and may be dependent on seasonal variations.

3.5 GROUND GAS AND VAPOURS

Ground gases are discussed in full in Section 6. In summary, the concentrations of ground gases recorded during the monitoring programme are presented in Appendix G and summarised below:

- Methane has not been detected.
- Carbon dioxide between 0.0%v/v and 0.7%v/v.
- Oxygen between 19.3%v/v and 19.7%v/v.

No gas flow has been recorded during the monitoring completed to date. It should be noted that the majority of the response zones in the installations were recorded as being 'flooded'.

3.6 SUMMARY OF FIELDWORK OBSERVATIONS

The fieldwork has revealed/confirmed the following:

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Significant Features identified during fieldwork

No made ground recorded or source of contamination identified.
--

Shrinkable cohesive strata encountered.

Perched groundwater / wet strata recorded in occasional bands of sand.
--

Excavations generally stable, but wet sand layers will be unstable in the short to medium term.

No methane detected, whilst carbon dioxide concentrations are below 5%v/v.
--

4 LABORATORY ANALYSES RATIONALE

4.1 CHEMICAL LABORATORY ANALYSIS

Chemical laboratory analyses were selected to provide the parameters necessary to make an initial assessment of potentially contaminated soils and/or waters, for the budgetary design of the development. The choice of contamination testing was based on the Phase I assessment, identified past uses of the site, site observations and comprised:

- Eight samples (5 of topsoil and 3 of natural strata) were analysed for a general suite of contaminants (metals, inorganics and speciated PAH).

The chemical analysis results are presented in Appendix H. Representative samples from across the area investigated were tested.

4.2 GEOTECHNICAL LABORATORY TESTING

Geotechnical soils testing has been undertaken as part of the ground investigation including the following:

- Seven samples of the natural strata (Bosworth Clay Member) were tested for Natural Moisture Content.
- Seven samples of the natural strata (Bosworth Clay Member) underwent Atterberg Limits (PI) classification.
- Fifteen samples (5 of topsoil and 10 of natural strata) underwent pH and water soluble sulphate testing, for concrete designation.

Geotechnical tests were selected to provide the parameters necessary for the budgetary design of the development including foundations and infrastructure. The geotechnical test results are presented in Appendix I and summarised in Section 10.2. Representative samples from across the area investigated were tested.

5 QUANTITATIVE RISK ASSESSMENT – HUMAN HEALTH (SOIL)

5.1 INTRODUCTION

Development proposals comprise the construction of a number of residential properties with associated private gardens / soft landscaping, along with an area of public open space / play area, access roads, an attenuation pond and infrastructure.

Various sources of contamination have been put forward in the earlier text and summarised in the Phase I conceptual model. The material on site identified as being the most likely to be contaminated is the topsoil.

The rationale for the end use specific Tier 1 Acceptance Criteria (TAC) used by GRM is outlined in Appendix A (vi) and for this site the chemical analysis results are being compared against the TAC for a residential with plant uptake end-use. In order to adopt a conservative approach a Soil Organic Matter (SOM) content of 2.5% has been used to assess the topsoil and natural strata samples, as this closely reflects the lowest SOM recorded.

To provide an initial assessment, the results have been assessed to determine whether benzo(a)pyrene could be used as a surrogate marker in the assessment of carcinogenic risks posed by genotoxic PAHs in soils. It is recommended that such assessments should be based upon toxicological benchmarks derived from the data for two coal tar mixtures presented by Culp et al. (1998) and as described in the Public Health England document contaminated land information sheet: risk assessment approaches for polycyclic aromatic hydrocarbons (PAHs) dated 2017. The graph completed shows that benzo(a)pyrene can be used as a surrogate marker for genotoxic PAHs, with the exception of naphthalene, for the natural soils. GRM's TACs use published C4SL values which are based on minimal risk levels and have been confirmed to be suitable for use in a planning context by the UK Government. Other commercially available values have been published and have been used where C4SLs are not available.

The chemical analysis results and a copy of the PAH profile graph are presented in Appendix H, whilst the GRM contaminant screening values are presented in Appendix J. The PAH profile graph confirms that the use of benzo(a)pyrene as a marker is appropriate.

5.2 RISK TO END USERS

Whilst the number of samples tested is considered sufficient to characterise the topsoil and natural strata, it is not considered appropriate to carry out statistical analysis on this data set. Therefore, the results for the topsoil and natural strata have been compared directly against the TAC for a residential with plant uptake end-use.

5.2.1 Analysis of Soil Contamination Data

GRM General Suite

Topsoil

Five representative samples of the topsoil have been analysed for a general suite of contaminants. The recorded concentrations of all the contaminants were below the relevant TAC for a residential with plant uptake end-use.

Natural Strata

Three representative samples of the natural strata have been analysed for a general suite of contaminants. The recorded concentrations of all the contaminants were below the relevant TAC for a residential with plant uptake end-use.

5.2.2 Water Supply Pipes

It is considered that, based on the UKWIR guidance, the concentrations of contaminants recorded to date are such that PE water supply pipes should be suitable for the site. There was no visual or olfactory evidence for the presence of petroleum hydrocarbons.

However, it is recommended that the local water supply company for the site be contacted to confirm their requirements with regard to pipe materials.

5.2.3 Summary of Risk to End Users

The risk to end users from soil contamination is considered to be negligible.

Remedial works are not considered to be necessary. The topsoil is chemically suitable for reuse on site and for sale, if there is a surplus of material.

5.3 RISK TO SITE WORKERS

The investigation has not revealed any specific contamination risk to site workers; however, the general comments outlined in Appendix A (vii) should be considered when site specific risk assessments are completed. The use of suitable PPE should be enforced during the ground works stage of construction.

6 QUANTITATIVE RISK ASSESSMENT – HUMAN HEALTH (GROUND GAS)

The gas risk assessment methodology used by GRM is outlined in Appendix A (v).

The proposed land use is classed as high sensitivity (residential housing with gardens), and six 35mm diameter gas/water monitoring standpipes have been installed across the site development area. The standpipes have been installed in the window sample boreholes (WS01-WS06), with response zones in the natural strata due to the absence of made ground.

Based on 'BS8576:2013 Guidance on investigations for ground gas – Permanent Gases and Volatile Organic Compounds', the gas hazard is considered to be very low (natural soil strata with low degradable organic content).

The monitoring programme will comprise six visits over a three month period. To date two visits have been completed; therefore, only an initial assessment of the local gas regime has been undertaken at this stage and further visits will be required to complete the monitoring program. A separate gas addendum letter report will be issued following the completion of the full monitoring program.

The gas monitoring results to date are presented in Appendix G and summarised in Section 3.5. The gas monitoring has been undertaken using a Gas Data GFM436.

The primary guidance document to determine if protection measures are required is BS8485:2015+A1:2019 *Code of practice for the design of protective measures from methane and carbon dioxide ground gases for new buildings*. This uses hazardous gas flow rates (Q_{hg}), which are gas concentrations multiplied by borehole flow rates, to derive a Gas Screening Value (GSV) for the site. The gas regime is then determined based on the GSV and other limiting factors such as gas concentrations.

A default gas flow rate of 0.1l/hr and a default methane concentration of 0.1%v/v have been used in the following assessment.

Using a default flow rate of 0.1l/hr and a default methane concentration of 0.1%v/v, a Q_{hg} of 0.0001l/hr has been calculated for methane. Using the same default flow rate, the maximum steady state carbon dioxide concentration of 0.7%v/v equates to a Q_{hg} of 0.0007l/hr. On this basis, the GSV for the site is determined as 0.0007l/hr.

As the maximum concentration of methane is <1%v/v, the maximum concentration of carbon dioxide is <5%, and the maximum GSV is <0.07l/hr, the site has been assessed as 'Characteristic Situation 1' or CS1 as outlined in BS8485:2015+A1:2019, for which gas protection measures are not required. This is in line with the sites conceptual site model. It should be noted that the majority of the response zones in the installations were recorded as being 'flooded'. However, given the lack of a source of ground gas, the overall conceptual site model, and no significant differences in gas readings between the response zones that are flooded and those that are not flooded, the gas concentrations recorded are justifiable.

It should be noted that both rising and falling pressure (worst case condition) have been recorded during the monitoring visits so far undertaken.

Therefore, at this stage, it is considered that gas protection measures for methane or carbon dioxide are not required for the proposed residential development. Following completion of the gas monitoring programme to confirm the preliminary appraisal, a gas risk addendum letter report will be issued.

In addition, the desk study risk assessment determined that no radon gas protection measures are required.

6.1 SUMMARY OF RISK FROM GAS

The investigation has not revealed any specific risk to end users from methane or carbon dioxide and gas protection measures are unlikely to be required; however, the gas monitoring programme needs to be completed to confirm this.

7 QUANTITATIVE RISK ASSESSMENT - CONTROLLED WATERS

The methodology, rationale and guidance GRM have used to assess the risk to controlled waters is set out in Appendix A (viii).

The confirmed geology at the site is the Bosworth Clay Member to proven depths of at least 4.0m begl. The Bosworth Clay Member is classified as unproductive strata. There are no recorded potable water abstractions within 1km of the site, and the site is not recorded to be within a Groundwater Source Protection Zone. Therefore, it is considered that a primary receptor for groundwater has not been identified within the site area.

Chemical analysis has not identified any elevated contaminants in the topsoil or underlying natural strata. A potential significant source of contamination has not been identified at the site and, in the absence of a source, there is considered to be no risk to controlled waters and so soil leachate/water analysis has not been undertaken.

7.1 INTERPRETATION OF GROUNDWATER OBSERVATIONS AND MONITORING

Slight seepages of perched groundwater or damp / wet strata were recorded within rare sand pockets, within the Bosworth Clay Member. Perched groundwater within separate bands of sand were recorded in TP09 (1.6-1.85m begl), WS04 (1.9-2.2m begl and 3.0-3.2m begl) and WS06 (1.5-2.4m begl and 3.1-3.5m begl).

Two groundwater monitoring visits have been conducted at this stage and the results of the monitoring are reported in Appendix G. In summary, standing water was recorded in each of the installations, varying between 0.3m and 2.8m begl, over the course of the two monitoring visits.

It should be noted that the majority of the response zones in the installations were recorded as being 'flooded'. It is believed that the installations are acting as 'sump holes' for groundwater from the sand layers and shallow surface water ingress (due to persistent rain), and the levels recorded are not a true reflection of shallow groundwater.

7.2 SUMMARY OF RISK TO CONTROLLED WATERS

As no source of soil contamination has been identified and with there being no obvious primary receptor (either productive aquifer or surface water), there is negligible risk to the underlying groundwater.

8 PHASE II CONCEPTUAL SITE MODEL

HUMAN HEALTH			
Source	Pathway	Receptor	Remedial Solution
None identified.	Indoor and outdoor inhalation of soil dust; the ingestion of, and dermal contact with, contaminated soil and soil dust; ingestion of vegetables that have taken up contamination and contaminated soil attached to vegetables.	End users.	No remediation required.
		Construction workers.	
No source identified.	Inhalation of ground gas.	End users.	Gas precautions not required at this stage (to be confirmed following completion of gas monitoring programme).
None identified.	Migration of contamination through leaks and joints, degradation of water pipe materials.	Water supply pipes.	PE water supply pipes and clean backfill required (to be confirmed by water supply company).
CONTROLLED WATERS			
None identified.	Leaching of contaminants and vertical migration to the groundwater.	Unproductive strata (Superficial Deposits – Bosworth Clay Member).	No remediation required.

9 REMEDIATION

9.1 RECOMMENDED REMEDIAL MEASURES AND VALIDATION REQUIREMENTS

9.1.1 Protection of End Users

Soil Contamination

Development proposals comprise the construction of a number of residential properties with associated private gardens / soft landscaping, along with an area of public open space / play area, access roads, an attenuation pond and infrastructure.

A source of soil contamination has not been identified and so remedial measures are not required.

The existing topsoil has been shown to be uncontaminated and can be used as a growing medium in private gardens and soft landscaping.

Any topsoil / subsoil strip will need to be undertaken when the material is dry. The stripped material will need to be stockpiled and stored in accordance with the Defra Code of Practice *Construction Code of Practice for the Sustainable Use of Soils on Construction Sites*, BS8332:2015 and BS8601:2013. The topsoil / subsoil will need to be placed within garden areas in accordance with the methods outlined in the aforementioned documents, taking care not to compact them whilst doing so. Should soils become compacted as part of the building process then allowance should be made for the soils to be loosened and thereby promote aeration and drainage, which will reduce water-logging and subsequent aftercare costs.

Should any material suspected of being significantly contaminated be encountered during the redevelopment of the site, GRM can be contacted to undertake additional investigation if necessary. The local Environmental Health Officer should be contacted and informed of any additional remedial work required.

Ground Gas

At this stage, gas protection measures for methane or carbon dioxide are not required but this will be reviewed on completion of the gas monitoring programme.

No radon gas protection measures are required.

9.1.2 Protection of Site Workers

The risk to site workers from soil contamination is negligible. No remedial measures are required. However, the use of suitable PPE should be enforced during the ground works stage of construction.

9.1.3 Protection of Controlled Waters

The risk to controlled waters is considered negligible and no remedial measures are required.

9.1.4 Protection of Water Pipes

It is considered that, based on the UKWIR guidance, the concentrations of contaminants recorded to date are such that PE water supply pipes should be suitable for the site. There was no visual or olfactory evidence for the presence of petroleum hydrocarbons.

However, it is recommended that the local water supply company for the site be contacted to confirm their requirements with regard to pipe materials.

9.2 REMEDIAL STRATEGY

A Remediation Method Statement is not considered to be necessary.

Once the gas monitoring programme has been completed, a Gas Protection Measures Design and Verification Plan may need to be produced if it is determined that gas protection measures are required, together with independent validation of the gas membrane installation.

Following your review of this document, we would recommend that a copy of it be forwarded to the Local Authority for comment and approval, prior to commencing development of the site. The Local Authority may choose to include other consultees as part of the planning process (such as the Environment Agency).

Consultation should be undertaken at the earliest possible opportunity to avoid abortive or delayed works.

9.3 DISPOSAL AND CLASSIFICATION

Based on the chemical results, the topsoil and underlying natural strata at the site have been classified using the HazWaste Online software, should they require disposal offsite. Waste Classification Reports for both the topsoil and natural strata are presented in Appendix K.

Both the topsoil and natural strata have been classified as Non-Hazardous Waste. The natural strata underlying the site are likely to be classified as Inert for disposal purposes; however, further testing will be required to confirm this. At this stage, allow for the topsoil to be disposed of as non-hazardous waste (if it can't all be reused) and the underlying subsoil to be disposed as inert.

Care should be taken to keep natural arisings separate from construction materials, as natural soils mixed with construction materials may attract additional disposal costs.

It is recommended that any materials to be exported are stockpiled and tested to confirm disposal rates, as this may be more cost effective than using the results contained within this report.

10 GEOTECHNICAL ASSESSMENT

10.1 INTRODUCTION

The development proposals comprise the construction of a number of residential properties with associated private gardens / soft landscaping, along with an area of public open space / play area, access roads, an attenuation pond and infrastructure.

Finished floor levels and the levels of any underground engineering works have not been provided.

In addition to the site specific comments below reference should be made to the general comments relating to the Geotechnical Assessment listed in Appendix A (xi to xvi).

10.2 GEOTECHNICAL TESTING

Geotechnical testing has been carried on site; the results of this testing are provided on the logs in Appendix E and in Appendix I. These results are summarised in the tables below:

Insitu Testing for Bosworth Clay Member (Superficial Deposits):

Test Parameter	Range of Results
SPT 'N' values	11 to 14 @ 1m (medium strength) 8 to 21 @ 2m (medium to high strength or medium dense) 10 to 28 @ 3m (medium to high strength or medium dense) 17 to 26 @ 4m (high strength)
Hand Shear Vane	40 to 120kPa

Laboratory Testing for Bosworth Clay Member (Superficial Deposits):

Test Parameter	Range of Results
Natural Moisture Content	18.4% to 25%
Plasticity Index	22% to 28%

The above Plasticity Index (PI) test results indicate that the cohesive strata for the Bosworth Clay Member (proposed founding strata), are of medium (PI 20% to <40%) volume change potential (VCP). For the subsequent foundation assessment, medium volume change potential should be used for design purposes.

10.3 ENGINEERING GROUND TREATMENT

Engineering ground treatment is not considered to be necessary. It is therefore considered unlikely that significant pre-treatment of the surface soils will be required for any small plant/personnel movements.

For a piled foundation solution (see Section 10.6), a suitable working platform (i.e. piling matt) will be required. It is recommended that the design of the working platform is carried out as soon as possible. The working platform certificate requires signing by the Principal Contractor for the site. An allowance for this, and responsibility for the design of the platform (estimated at 400mm thick if constructed without reinforcement depending on the quality of any earthworks), should be made in tender packages and site programmes.

The existing sewers will need grubbing out and backfilling, or grouting, where they are not being retained within the new development.

10.4 EXCAVATION CONDITIONS

Excavation of the materials encountered during the ground investigation should be readily achieved using conventional hydraulic excavation techniques.

From the trial pit stability observations, it is likely that excavations will mostly remain stable. Some side trench collapse is inevitable particularly in the medium term and in inclement periods. Granular soils (intermittent bands of wet sand) are liable to collapse without warning; this situation is likely to be exacerbated by water ingress. If required, trench stability should be maintained by providing full support to the side walls, in line with the necessary Temporary Works procedures and Code of Practices.

The observed groundwater conditions suggest that the use of conventional sump pumping would be adequate to control any water ingress in shallow excavations.

10.5 EXISTING STRUCTURES / SUBSTRUCTURES

At the time of the investigation works, no building structures were present within the site area. There has been no previous development of the site.

Existing sewers crossing the site area, along with underground (and overhead) electricity cables, will need to be taken into account.

10.6 FOUNDATIONS

The topsoil and any soft natural strata not recorded previously, are considered unsuitable as a bearing stratum and all new foundations should be carried down

through them to found on the more competent natural cohesive strata (with an undrained shear strength of more than 60kPa).

Anticipated founding strata comprises firm to stiff slightly sandy slightly gravelly CLAY. The granular layers recorded (i.e. intermittent bands of wet sand) should not be deepened through unless deemed incompetent as a bearing strata. If they are deemed competent, then foundations should be reinforced between the clay and sand junction. This is to avoid deepening through wet sand, with associated instability and collapse.

A minimum foundation depth of 0.90m begl (medium volume change potential) will be applicable for this site. Hedgerows and mature trees border the entire site area. This means that appropriate foundation deepening will be required, particularly for those plots close to the western edge of the site based on the development layout plan included in this report.

Development proposals comprise the construction of a number of residential properties (assumed mostly two storey in height).

TRENCH FILL

It is considered likely that trench fill foundations, founded within the natural cohesive strata, will be suitable for the proposed residential development. The founding strata are likely to comprise firm to stiff slightly sandy slightly gravelly sandy clay. At this stage, a minimum foundation depth of 0.90m begl will be applicable for this site, and anticipated founding depths could be deeper than 2.5m begl in places, due to deepening for trees / hedges. Some deepening beyond the minimum depth may be needed, particularly in the east of the site where shallow 'softer' clay is present.

The natural cohesive soils encountered, at anticipated foundation depths, were generally at least firm (medium strength). It is anticipated that a nett allowable bearing pressure of at least 110kN/m² should be available for conventional strip or trench fill footings. This will allow line loads up to 50kN/m to be taken on footings 450mm wide and 66kN/m on footings 600mm wide. These line loads should result in total settlements of not more than 25mm, keeping differential settlements within acceptable limits.

Wider footings may be required for higher point/line loads such as at party walls etc. Should wider footings be required for higher point/line loads, GRM should be contacted for further advice.

Heave precautions will be required where the foundations lie within the heave zone of trees / hedges as defined in the NHBC Standards Chapter 4.2. Foundations should be remote from the direct action of tree roots, and should not be constructed so close to trees as to significantly damage their root systems.

Where trees and / or hedges are present within influencing distance of new build structures, the foundations within the zone of influence of these trees / hedges will need to be deepened in line with guidance in NHBC Standards Chapter 4.2. The resultant

foundation depths can only be determined by a tree survey and tree influence drawing (as well as proposed site levels and detailed layout drawings).

PILES

Depending on the final development layout, some plots may be located close enough to the existing trees / hedges along the boundaries of the site to require deepened trench fill foundations or even pile foundations.

The bearing strata for the piles will be the Bosworth Clay Member (or underlying Mercia Mudstone), which should comprise mainly clay along with variable sand layers.

A piling specialist will need to be approached to provide pile dimensions and safe pile capacities. They are likely to require the provision of cable percussion or rotary boreholes to provide information for detailed design (the boreholes would need to be a minimum 5m beyond anticipated pile lengths). Consideration should be given to nearby structures and infrastructure and achieving sufficient penetration to resist heave, when choosing the appropriate pile type. Piles less than 7.5m long are unlikely to be acceptable to the warranting bodies where the potential influence of trees is greater than 2.5m.

Non-displacement piling techniques such as CFA or bored piled foundations are recommended to minimise ground disturbance which could impact adjacent structures.

Whilst piled foundations would end bear beneath the influence of trees, the piles and ring beams should be designed to resist potential heave, down-drag and negative skin friction.

A testing regime and objectives of the works will need agreeing with regulatory and warranting bodies prior to works. The pile design will need to be justified to the warranting bodies and the justification should be included within the piling contract.

It should be noted that a working platform will be required by the piling contractor.

Pile layouts and ground beams will need to be engineer designed.

10.7 FLOOR SLABS

Once the development proposals have been clarified, then the type of floor slab can be confirmed. As proposed site levels are currently unknown, at this stage allowance for suspended floor slabs should be made throughout.

A suspended floor system incorporating a sub-floor void, such as beam and block, will be required for all properties where the foundations lie within the heave zone of trees as defined by NHBC Standards in Chapter 4.2, and where seasonally desiccated soils are present at the time of construction.

At this stage, gas protection measures will not be required. This will be reviewed on completion of the gas monitoring programme. No radon gas protection measures are required.

10.8 BURIED CONCRETE

Testing for pH and water soluble sulphate has been undertaken in the topsoil and natural soils. The results of the water soluble sulphate and pH testing are presented in Appendix H.

Based on the recorded water soluble sulphate and pH levels in the soils below the site and assuming static groundwater conditions for the site, in accordance with the requirements of BRE Special Digest 1 (2005), 'Concrete in Aggressive Ground', the Design Sulphate Class for buried concrete at the site should be assumed as DS-1 and the ACEC Class as AC-1s.

For unreinforced trench fill foundations with a width of greater than 450mm, the classifications above equate to a concrete designated as GEN1 in BS8500 and RC35 for reinforced foundations.

10.9 SLOPE STABILITY AND RETAINING STRUCTURES

The topography of the site is generally flat-lying, but with gentle sloping ground (downwards) from west to east.

Therefore, there is no significant risk of slope instability occurring at present gradients.

10.10 SEDIMENT MANAGEMENT

If required, mitigation measures should be implemented to prevent the runoff of sediment and potential pollution into any surface water, during the construction and earthworks process. Reference should be made to CIRIA C532 'Control of Water Pollution from Construction Sites'.

An Environmental Management Plan and Construction Management Plan will be required to prevent pollution of Controlled waters.

10.11 SOAKAWAY DRAINAGE

The strata encountered during the investigation (predominantly clay with intermittent layers of wet sand) is not suitable for soakaway drainage.

However, soakaway testing was undertaken as requested by the Client. The soakaway testing was undertaken in three of the trial pit excavations (TP01, TP06 & TP10). The

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exploratory hole location plan presented in Appendix D shows the approximate locations of the tests, corresponding to the relevant trial pits. The soakaway tests were carried out in the Bosworth Clay Member strata, which generally comprised slightly sandy slightly gravelly clay.

Only one test was able to be undertaken at each soakaway location, lasting around 4.5 hours. During the soakaway testing, the water in each pit was very slow to drop and the tests could not be completed satisfactorily. For each of the tests, the water level was virtually flat-lining (not significantly dropping) throughout the testing duration period. The time required for 25% or 75% of the pit emptied of water could not be achieved at any testing location. Therefore, a valid infiltration rate could not be calculated due to insufficient testing data.

Based on the soakaway testing undertaken, the cohesive strata predominantly encountered during the investigation have been shown to be fairly impermeable and are not suitable for soakaway drainage. An alternative drainage system should be considered for the disposal of surface water.

10.12 NEW ACCESS ROAD / NEW CAR PARKING AREAS

The topsoil and any soft natural strata are considered unsuitable as a sub-grade.

Site observations suggest that the natural cohesive soils will have CBR values of between 2% and 4%, when suitably drained. In inclement weather, lower values can be expected. Proof rolling and the replacement of soft spots may result in increased CBR values and the incorporation of a geotextile grid into sub-base layers may allow for reduced capping thickness.

Site observations should be confirmed by in situ or laboratory testing in accordance with the adopting Local Authority's preference. Insitu CBR testing immediately prior to road construction, if this is acceptable under the adopting authorities' procedures, may allow a more reliable CBR value to be used for design purposes.

11 FURTHER INVESTIGATION

Further investigation, to determine more accurately the effect of some of the identified hazards on the development, is recommended. This includes the following:

- Completion of the gas and groundwater monitoring programme is to be undertaken and an addendum gas risk assessment letter report will be issued at a later date following the issue of this report.
- Cable percussion or rotary boreholes will need to be undertaken to provide additional geotechnical information for pile design, if required.
- A piling specialist will need to be approached to confirm the appropriate pile type, provide pile dimensions and safe pile capacities, if required.
- Insitu CBR testing to be undertaken once proposed site levels are known.
- An arboricultural specialist will be required to conduct a tree survey.
- Liaison with the Local Water Supply Company to determine the appropriate water supply pipes at the site.

A copy of this report should be submitted to the Planning Department of the Local Authority/Local Authority EHO for review, if planning conditions exist for this site.

12 CONCLUSIONS

Assuming compliance with all the recommendations contained within this report (for abridged version see 'Summary of Recommendations' table at the beginning of the report) the site is suitable for the proposed development.

Based on the evidence currently available the site is assessed as being of low risk for both geotechnical and contamination hazards.



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GENERAL APPRAISAL COMMENTS

i INFORMATION SOURCES

Where available the following sources have been used for the identification and assessment of potential ground hazards:

- Relevant British Standards
- British Geological Survey (BGS) Geology Map Scale 1:10,000 for local area
- British Geological Survey (BGS) Geology Map Scale 1:50,000/1:63,320
- BGS Memoir
- BGS Borehole Records: <https://mapapps2.bgs.ac.uk/geoindex/home.html>
- BGS online viewer: <https://geologyviewer.bgs.ac.uk>
- Magic Groundwater Vulnerability Maps
- Historical Ordnance Survey (OS) Maps
- Environmental Data Report
- Environment Agency Website: <http://www.environment-agency.gov.uk/>
- Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites, UKWIR, 2010.
- Coal Authority Records / Coal Mining Report
- DEFRA/Environment Agency Contaminated Land publications and DoE Industry Profiles
- BRE Guide BR211 (2023), 'Radon: Guidance on protective measures for new buildings (including supplementary advice for extensions, conversions and refurbishment projects)'
- UK HSA Radon Maps: <https://www.ukradon.org/information/ukmaps>
- CIRIA C665 'Assessing risks posed by hazardous ground gases to buildings'
- BS8485:2015 +A1: 2019, 'Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'
- Other technical references used throughout this document are detailed in the text.

ii CONTAMINANTS OF CONCERN

The DoE Industry Profiles are normally used to assess likely contaminants from past land use and potential nearby industrial sources. For land uses where no profile is available, likely contaminants of concern are selected by GRM based on past experience of similar sites, a general screening suite of contaminants covered by CLEA and common contaminants from the Industry Profiles.

- | | | |
|------------|-------------------|--|
| · Arsenic | · Copper | · Water soluble sulphate |
| · Cadmium | · Nickel | · PAH (polycyclic aromatic hydrocarbons) |
| · Chromium | · Zinc | |
| · Lead | · Phenols | |
| · Mercury | · cyanide (total) | |
| · Selenium | · pH | |

Asbestos and PCBs are listed in the vast majority of profiles. PCBs are listed as the profiles expect electricity substations and switch boxes on all industrial sites. There is the potential for asbestos containing material to be mixed up with made ground, following any demolition works.

iii CONCEPTUAL MODEL METHODOLOGY

The consideration of contamination is based upon the principles of risk assessment, using the 'source-pathway-receptor' model in order to establish the presence, or potential presence, of a pollutant linkage.

To create a risk, contamination must have the potential to cause harm to susceptible targets or receptors such as humans, the water environment or the built environment. The potential for harm to occur requires three conditions to be satisfied to form a pollutant linkage:

- The presence of substances that may cause harm (SOURCE).
- The presence of a target which may be harmed (RECEPTOR).
- The existence of a plausible migration route between the source and the receptor (PATHWAY).

In the absence of a plausible pollutant linkage there is no risk. Where a potential linkage is identified in order for it not to pose a risk to the identified receptor it must be broken.

iv INTRUSIVE INVESTIGATION SAMPLING METHODOLOGY

The ground investigation (including fieldwork, sampling, monitoring and laboratory analyses) has been designed to identify and assess potential ground related problems and to allow cost effective solutions to be advised. It has been planned on the basis of the desk study, site inspection and the proposed development layout (where available). All fieldwork and soil descriptions were carried out in general accordance with relevant British Standards.

The exploratory holes have been positioned and advanced to depths to determine the general ground/groundwater/gas conditions below the site. A general grid pattern has been adopted, where possible, to provide sufficient information based on the current proposed layout scheme. Some holes have been targeted at particular hazards identified in the Phase I assessment. The resultant exploratory hole density is considered to be commensurate with the complexity of the site conditions and detail of information required for this phase of the investigation.

v GROUND GAS RISK ASSESSMENT METHODOLOGY

Gas monitoring programmes undertaken by GRM are designed to broadly comply with the recommendations outlined in CIRIA Report C665 'Assessing risks posed by hazardous ground gas to buildings' (2007) and BS8576 'Guidance on Investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs) (2013).

To assess the risks posed by ground gases such as radon, carbon dioxide and methane, the relevant current guidance has been used. For radon the site has been assessed following the guidelines in 'Radon: guidance on protective measures for new dwellings (including supplementary advice for extensions, conversions and refurbishment projects) (BR211: 2023)'. For methane and carbon dioxide the primary guidance document used to determine if protection measures are required is *BS8485:2015 Code of practice for the design of protective measures from methane and carbon dioxide ground gases for new buildings*. This uses hazardous gas flow rates (Q_{hg}), which are gas concentrations multiplied by borehole flow rates, to derive a Gas Flow Rate (GSV) for the site. The gas regime is then determined based on the GSV and other limiting factors such as gas concentrations.

Where flow is not recorded during the monitoring a default flow rate of 0.1l/hr will be used in the assessment to produce a positive result.

vi HUMAN HEALTH RISK ASSESSMENT METHODOLOGY

Guidance contained in the Environment Agency's CLEA Reports has been used to assess the risks posed to human health.

For residential developments that include domestic gardens the default Tier 1 Assessment Criteria (TAC) for 'residential land with plant uptake' are used, i.e. a female with a start age class of one and an end age class of six. All pathways are considered including the consumption of home-grown vegetables.

For residential developments that do not include domestic gardens the default Tier 1 Assessment Criteria (TAC) for 'residential land without plant uptake' are used, i.e. a female with a start age class of one and an end age class of six. All pathways are considered except the consumption of home-grown vegetables. For commercial/industrial developments the default Tier 1 Assessment Criteria (TAC) for 'commercial/industrial' are used, i.e. a female with a start age class of sixteen and an end age class of eighteen. All pathways are considered except the consumption of home-grown vegetables.

The TAC used by GRM include Category 4 Screening Levels (C4SLs) published by DEFRA, values calculated by GRM using the CLEA v1.071 risk assessment, and values and Suitable for Use Levels (S4UL) developed by LQM/CIEH. The TAC used in the assessment are selected based on the lowest site specific SOM values returned as part of the chemical analysis.

Where soil chemical analysis results are found to exceed the TAC, Site-Specific Risk Assessments may be undertaken using the CLEA v1.071 risk assessment software using the age classes and pathways described above.

vii RISK TO SITE WORKERS – GENERAL COMMENTS

The risks to site workers are similar to those posed to site end users, although likely to be less severe due to the site workers' shorter exposure to the identified contamination. However, site workers (particularly groundworkers) are more likely to come into direct contact with contaminated soils due to the nature of their work. On this basis ground and construction workers should be provided with basic Personal Protective Equipment based on the site's general health and safety risk assessment, but including as a minimum safety footwear, gloves and overalls.

A site specific risk assessment should be carried out for all hazards identified within the ground investigation in accordance with current health and safety legislation. This assessment should identify any measures required to further reduce risks i.e. providing further Personal Protective Equipment, welfare facilities and if necessary preventing access to certain areas.

Demolition and dismantling of existing structures on the site must be carried out to a safe and acceptable standard, in accordance with current UK guidance and best practice. Whilst not ground related, asbestos and hazardous substances surveys should be conducted prior to any demolition.

Any unusual colours, odours and suspicious ground should be reported immediately to site management and then GRM.

Whilst this appraisal has considered the long-term effects of contamination, GRM can also help during the formulation of Health and Safety documentation, if required.

viii CONTROLLED WATERS RISK ASSESSMENT METHODOLOGY

Where the desk study and fieldwork do not reveal a potential source of contamination no leachate or groundwater testing will be performed. Where a potential source is identified the testing will comprise leachate testing on the material considered most likely to pose a risk, groundwater testing will be undertaken if water is present at shallow depth.

The UK Drinking Water Standards (UKDWS) or Environmental Quality Standards (EQS) are usually adopted for comparison with the leachate/groundwater test results. When the most sensitive receptor is considered to be the aquifer (groundwater) UKDWS will be adopted as the Initial Tier 1 screening values.

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Where the most sensitive receptor is a surface water feature the EQS values will be used as Initial Tier I Screening values.

ix CONSTRUCTION MATERIALS RISK ASSESSMENT METHODOLOGY

The 'screening levels' adopted for the assessment of risk to construction materials are taken from the following documents:

- UK Water Industry Research (UKWIR) Contamination thresholds for sub-surface water pipes, for the protection of buried pipes.
- Building Research Establishment (BRE) Special Digest SD1 (2005), 'Concrete in Aggressive Ground', for the protection of buried concrete.

x WASTE DISPOSAL, SITE WASTE MANAGEMENT PLANS AND MATERIAL MANAGEMENT PLANS

Under current Waste Management Regulations, waste soil materials produced from the site will require characterisation to enable it to be disposed of correctly.

The chemical analysis results included in this report should be provided to the relevant landfill operators to establish the characterisation of the waste, confirm its suitability for landfill disposal and provide estimated costings. If material is classified as hazardous, then the site will need to be registered with the Environment Agency prior to the movement of the waste. Depending on the receiving landfill's current permit, further chemical analysis, incorporating Waste Acceptance Criteria (WAC) leachate analysis, may be required.

All materials removed from the site will be classified as 'waste' and therefore must be removed by a suitably licensed carrier of waste. This applies whether or not the waste is contaminated. All waste removed to landfill will attract Landfill Tax.

The developer/builder is likely to be classed as the waste producer and therefore, has a duty of care to ensure that all waste is disposed of appropriately. This includes ensuring the waste carrier is licensed and disposes of the waste to a suitably licensed landfill site. They are also required to keep a paper trail from 'cradle to grave' including copies of the waste disposal tickets.

Efficient materials management on site is recommended as it can lead to significant cost savings when compared to the traditional side casting or single stockpile of arisings. GRM can assist in the production of Material Management Plans under the CL:AIRE Definition of Waste: Code of Practice. The DoWCoP enables:

- The direct transfer and re-use of clean naturally occurring soil materials between sites, and
- The re-use of both contaminated and uncontaminated materials on their site of origin and between sites within defined Cluster projects.

GRM can also undertake the role of Qualified Person and submit the DoW CoP project Declaration.

Likewise making the site as volume neutral as possible will reduce the costs of development. Whilst not a statutory requirement, Site Waste Management Plans allow better waste management practices, help to reduce the amount of waste produced and identify best environmental disposal options. Implementing a Site Waste Management Plan (SWMP) can reduce costs (increasing business profits) and maximise resource efficiency.

xi GEOTECHNICAL ASSESSMENT GENERAL COMMENTS

Where finished floor levels of proposed structures have not been provided by the Client, then for the purposes of initial assessment, GRM will assume that finished levels will not vary appreciably from the existing ground levels. If the depths of any underground engineering works (i.e. sewers, pumping stations etc.) are unknown they will not be taken in to account in the assessment and it will be assumed that any such works will not compromise foundation or ground stability.

Should the development proposals or finished levels be different from these assumptions then the comments/recommendations in the Geotechnical Assessment may require revising.

It should be noted that the results of window sampling and/or cable percussive boreholes may not give a true indication of a soils actual engineering properties (i.e. stability, mass structure etc). GRM consider that that prior to development trial pitting should be undertaken to confirm the recommendations in the Geotechnical Assessment.

xii GEOTECHNICAL ASSESSMENT – ENGINEERING GROUND TREATMENT

Near surface soils have the potential to be disturbed by weathering and site traffic. Precautions should always be taken to avoid this, as excessive disturbance may leads to more onerous floor slab designs, road cap thickness and increased amounts of off-site disposal etc.

Near surface soils may need treatment or reinforcing to allow safe movement of construction plant and labour. An assessment by the contractor should be undertaken once the type of machinery/plant needed to complete the development is known.

xiii GEOTECHNICAL ASSESSMENT – EXCAVATIONS

Excavation instability (over-break) can result in damage to existing services or structures (e.g. foundations, roads or boundary walls/fences) both on and off-site, as well as increased foundation concrete costs. In order to minimise this, all excavations deeper than 1.2m deep (or any excavation within 1.5m of any existing structure or service) should be supported. Full support should be provided to the full depth of all near vertically sided excavations in made ground, soft and very soft clays and granular soils. A reduction to intermediate support should be acceptable within firm and stiffer natural clays.

Wherever possible, man entry into excavations should be prevented; however, where this is not possible, entry to, and time spent in, excavations should be kept to a minimum.

The build program should be tailored to reflect the impact that deep excavations through potentially unstable strata can have on adjacent properties, so that they are not undermined.

All excavations on site should be in accordance with HSE guidelines and stability should be practically maintained at all times. Reference should be made to HSE construction information sheet No. 8 (Revision 1) 'Safety in Excavations'.

Care should be taken to ensure that falls from excavation faces do not adversely affect the integrity of foundation concrete.

If contaminated water enters excavations it should be removed and transported to an appropriate treatment facility by a suitably licensed carrier before construction begins.

xiv GEOTECHNICAL ASSESSMENT – SUBSTRUCTURES

Where practicable, existing buried construction should be fully removed; however, if this is not practicable all new foundations should be carried down to fully penetrate it and it should be broken well away from all new structures.

There may be existing structures and/or infrastructure in close proximity to the proposed development. New build foundations may be constructed next to pavements with existing underground services beneath them, or excavations may be required near existing footings associated with adjacent properties. These potential hazards need to be taken into consideration when designing foundations and the groundworker needs to be made aware of their potential impact during the redevelopment works. Foundations close to existing underground services or buildings may require alternative foundation techniques (such as piling) to protect the integrity of these structures.

The contractor for the works should carry them out in such a fashion so as to not cause excessive overbreak, concrete usage or undermine existing buildings/roads/ services that are to be retained.

xv **GEOTECHNICAL ASSESSMENT – SOAKAWAYS**

Soakaway testing in trial pits by GRM is broadly carried out in accordance with BRE DG 365 (2016). The testing comprises the excavation of a test pit to a suitable depth, and the placement of water into the pit. The level of water present is then monitored over time. For borehole installations, the permeability testing (falling head/rising head) is undertaken in accordance with BS5930.

If it is decided to proceed with the use of soakaway drainage, then the following general points should be noted:

- Soakaways should not be placed so that water can be discharged through potentially contaminated made ground.
- The Environment Agency may require soakaways to be sealed systems such that only roof run off falls to soakaway.
- Interceptors are likely to be required for soakaways for highway drainage. The adopting authority for the highways should be consulted at the earliest opportunity regarding the use of soakaways for highways drainage.
- Consideration of site levels and slopes should be taken into account during the design.
- The construction of all soakaways should be in accordance with the current building regulations.
- Soakaways should not be placed within 5m of a proposed building.
- Placement of soakaways needs to be considered so as to avoid ponding of water down slope.
- The base of a soakaway should not be below the highest recorded water level.
- The Environment Agency prefer 1m of dry soil to be present between the base of a soakaway and the water table to provide attenuation for contamination.

xvi **GEOTECHNICAL ASSESSMENT – FOUNDATIONS**

If soft or hard spots are encountered during foundation excavation then they should be replaced with suitably compacted material or the footings deepened to suitable strata, to avoid differential settlement.

If strata of differing bearing character (e.g. sand and clay) are encountered at foundation levels within the excavations for a single plot then the excavation depths should be altered as appropriate to ensure the foundations rest on a single stratum, or strata that will not induce differential settlement. Where this is impractical then GRM should be contacted to assess a reinforced concrete detail or an alternative foundation solution (e.g. piles or vibro-replacement).

NOTES ON LIMITATIONS

General

GRM Development Solutions Limited has prepared this report solely for the use of the Client and those parties with whom a warranty agreement had been executed, or with whom an assignment had been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from GRM Development Solutions Limited; a charge may be levied against such approval.

GRM Development Solutions Limited accepts no responsibility or liability for:

- a) the consequences of this document being used for any purpose or project other than for which it was commissioned, and
- b) the consequences of this document being used by any third party with whom an agreement has not been executed.

Phase I Environmental Audits/ Desk Studies

The work undertaken to provide the basis of this report comprised a study of available documented information from a variety of sources (including the Client), together with (where appropriate) a brief walk over inspection of the site and meetings and discussions with relevant authorities and other interested parties. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only to the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, GRM Development Solutions Limited reserves the right to review such information and as considered necessary and appropriate to modify the opinions accordingly. It should be noted that any risks identified in a Phase 1 report are perceived risks based on the information reviewed; actual risks can only be assessed following a physical investigation of the site.

Phase II Environmental Audits (Contamination Investigations)

The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, ground and groundwater conditions to allow a reasonable risk assessment to be made. The objectives of the investigation have been limited to establishing the risks associated with potential human targets, building materials, and controlled waters.

The amount of exploratory work and chemical testing undertaken has necessarily been restricted by the short timescale available, and the locations of exploratory holes have been restricted to the areas unoccupied by the building(s) on the site and by buried services. A more comprehensive investigation may be required if the site is to be redeveloped as, in addition to risk assessment, a number of important engineering and environmental issues need to be resolved.

For these reasons if costs have been included in relation to site remediation these must be considered as provisional only and must, in any event, be confirmed by a commercial adviser.

The exploratory holes undertaken, which investigate only a small volume of the ground in relation to the size of the site, can only provide a general indication of site conditions. Whilst exploratory testing is intended to gain an accurate representation of the site, the very nature of sampling and testing is such that it cannot ensure that all localised conditions are detected.

The risk assessment and opinions provided take in to consideration, inter alia, currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.

Phase II Geo-environmental Investigations (Combined Geotechnical and Contamination Investigations)

The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, geotechnical characteristics, and ground and groundwater conditions to provide a reasonable assessment of the environment risks together with engineering and development implications. If costs have been included in relation to site development a commercial adviser must confirm these.

The exploratory holes undertaken, which investigate only a small volume of the ground in relation to the size of the site, can only provide a general indication of site conditions. The opinions provided and recommendations given in this report are based on the ground conditions apparent at the site for each of the exploratory holes. There may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which have therefore not been taken into account in this report.

The comments made on groundwater conditions are based on observations made at the time the site work was conducted. It should be noted that groundwater levels will vary owing to seasonal, tidal and weather related effects. The scope of the investigation was selected on the basis of the specific development proposed by the Client and may be inappropriate to another form of development or scheme.



The risk assessment and opinions provided take in to consideration, inter alia, currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.



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DO NOT SCALE

NOTES:

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Burton-on-Trent, Staffordshire
Tel: 01283 551 249
info@grm-uk.com www.grm-uk.com

CLIENT:

Avant Homes (Midlands)

PROJECT:

Lychgate Lane, Burbage

TITLE:

Proposed Development Plan

SCALE@SIZE :	ISSUE:
NTS	FINAL
DESIGN/DRAWN :	DATE:
RHC	Jan 2024
PROJECT No:	DRAWING No:
P10481	Figure 1

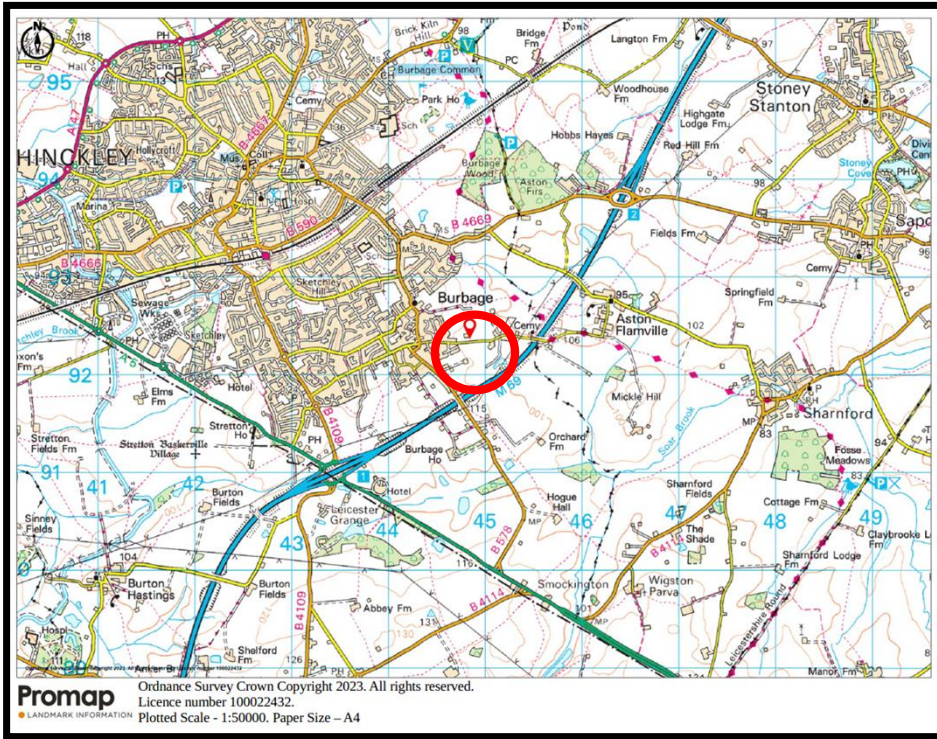
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DO NOT SCALE
NOTES:

 Approximate site location

 Approximate site boundary



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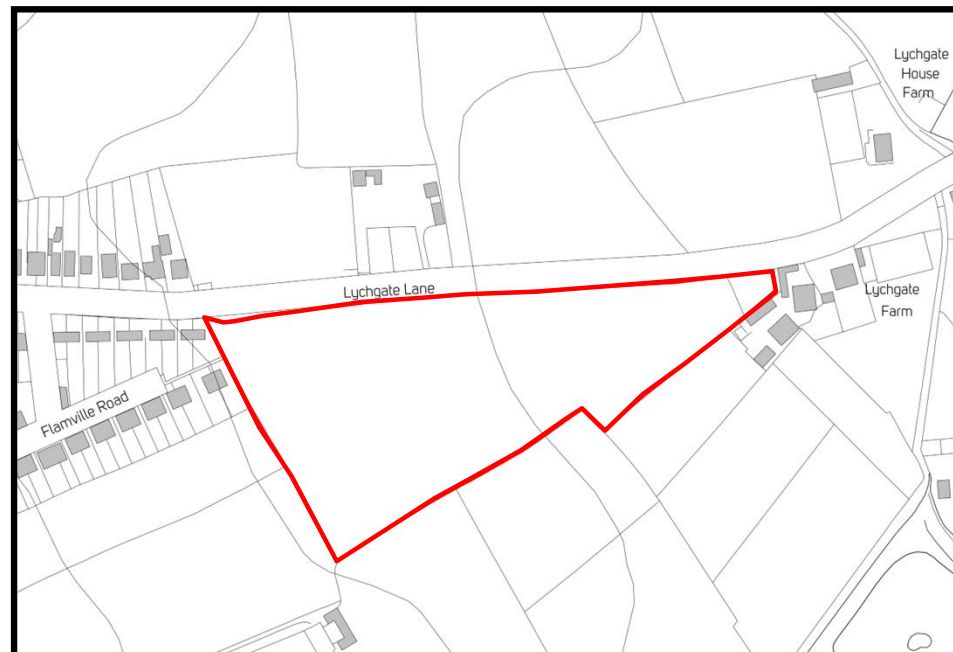
CLIENT:
Avant Homes (Midlands)

PROJECT:
Lychgate Lane, Burbage

TITLE:
Site Location and Boundary Plan

SCALE@SIZE:	ISSUE:
NTS	FINAL
DESIGN/DRAWN:	DATE:
RHC	Jan 2024
PROJECT No:	DRAWING No:
P10481	Figure 2

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A P P E N D I X D

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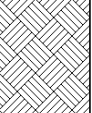
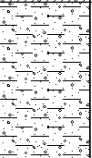
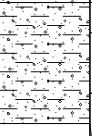
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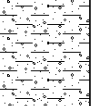
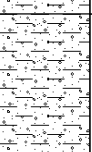
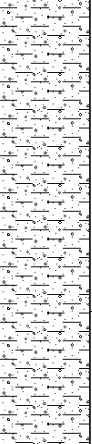


A P P E N D I X E

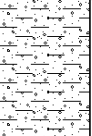
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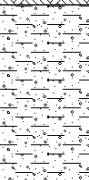
		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Trial Pit Log			Trial Pit No TP01 Sheet 1 of 1		
Site Name: Lychgate Lane, Burbage, Leicestershire							Ground Level (mAOD) 109.12		
Client: Avant Homes (Midlands)					GRM Project Ref: P10481		Coordinates 444779 E 292265 N		
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
	0.10	D		0.38	108.74		Dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of mudstone and quartzite. TOPSOIL	1 2 3 4	
	0.10	ES							
	0.80	D	HVP=65 HVP=70 HVP=70	0.90	108.22		Stiff, high strength dark orangish brown and occasionally light grey mottled slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of mudstone with rare quartzite, chalk and flint, including rare cobbles. BOSWORTH CLAY MEMBER		
	0.80								
	0.80								
	0.80	D	HVP=85 HVP=90 HVP=92	1.30	107.82		with rare 0.05m to 0.30m slightly damp pockets of orangish brown clayey fine to medium sand, and sandy clay encountered between 0.90m and 1.00m depth. with a 0.50m diameter boulder of angular mudstone encountered at 1.20m depth. End of Pit at 1.300m		
	1.00								
	1.30	D							
	1.30								
	1.30								
1.30									
Date Excavated: 05/01/2024				Groundwater Observations:					
Date Backfilled: 05/01/2024				No groundwater encountered during excavation.					
Shoring: None.									
Stability: Remained stable.									
Plant Used: CAT 308 CR				Trial Pit Dimensions (m):		Reason for termination of Trial Pit:			
Logged by: AT				0.65 		Trial pit completed as a soakaway test pit.			
General Remarks:									
Relative density is approximate and determined by observation only.				Version: FINAL			Scale: 1:25		

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Trial Pit Log			Trial Pit No TP02 Sheet 1 of 1		
Site Name: Lychgate Lane, Burbage, Leicestershire							Ground Level (mAOD) 108.97		
Client: Avant Homes (Midlands)					GRM Project Ref: P10481		Coordinates 444797 E 292238 N		
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
	0.15 0.15	D ES		0.28	108.69		Dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of mudstone and quartzite. TOPSOIL	1 2 3 4	
				0.70	108.27		Firm, medium strength light yellowish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of mudstone and sandstone. BOSWORTH CLAY MEMBER		
	0.90 0.90 0.90		HVP=65 HVP=68 HVP=70				Firm, medium strength, becoming stiff, high strength, dark orangish brown and occasionally light grey mottled slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of mudstone with rare quartzite, chalk and flint, including rare cobbles. BOSWORTH CLAY MEMBER		
	1.20 1.20 1.20 1.20	D	HVP=105 HVP=115 HVP=90				with rare 0.05m to 0.40m slightly damp pockets of orangish brown clayey fine to medium sand, and sandy clay encountered between 0.70m and 3.00m depth. With clay becoming locally firm around damp sand pockets. becoming stiff, high strength from 1.20m depth.		
	1.70 1.70 1.70 1.70	D	HVP=115 HVP=115 HVP=120				with rare 0.30m to 0.45m diameter boulders of angular mudstone and sandstone encountered from 2.50m depth.		
	2.50 2.50 2.50 2.70		HVP=100 HVP=115 HVP=120	3.00	105.97		End of Pit at 3.000m		
	Date Excavated: 05/01/2024				Groundwater Observations:				
Date Backfilled: 05/01/2024				Slight seepages of perched water encountered within rare sand pockets.					
Shoring: None.									
Stability: Remained stable.									
Plant Used: CAT 308 CR				Trial Pit Dimensions (m):		Reason for termination of Trial Pit:			
Logged by: AT				0.60  2.50		Trial pit terminated on target depth.			
General Remarks:									
Relative density is approximate and determined by observation only.									
Version: FINAL Scale: 1:25									

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Trial Pit Log			Trial Pit No TP03 Sheet 1 of 1				
Site Name: Lychgate Lane, Burbage, Leicestershire							Ground Level (mAOD) 109.62				
Client: Avant Homes (Midlands)					GRM Project Ref: P10481		Coordinates 444802 E 292206 N				
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description				
	Depth	Type	Results								
	0.15 0.15	D ES		0.30	109.32		Dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of mudstone and quartzite. TOPSOIL				
							Firm, medium strength dark orangish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of mudstone with rare quartzite, chalk and flint, including rare cobbles. BOSWORTH CLAY MEMBER <i>rare rootlets between 0.30m and 1.00m depth.</i>				
	0.80 0.80 0.80 0.85	D	HVP=50 HVP=55 HVP=65				<i>with occasionally 0.05m to 0.30m pockets of damp slightly silty slightly gravelly fine to coarse sand encountered between 1.00m and 3.40m depth. Gravel is medium to coarse and subrounded of mudstone. Clay is locally firm around damp sand pockets.</i>				
	1.30 1.30 1.30 1.40		D				HVP=70 HVP=70 HVP=75	<i>becoming very sandy between 1.40m and 2.00m depth.</i>			
	2.00 2.00 2.00	D					HVP=100 HVP=88 HVP=90	<i>becoming stiff, high strength from 2.00m depth.</i>			
	2.40		D								
	2.80	D									
							3.40	106.22		End of Pit at 3.400m	
	Date Excavated: 05/01/2024						Groundwater Observations:				
Date Backfilled: 05/01/2024				Slight seepages of perched water encountered within rare sand pockets.							
Shoring: None.											
Stability: Remained stable.											
Plant Used: CAT 308 CR				Trial Pit Dimensions (m):		Reason for termination of Trial Pit:					
Logged by: AT				0.60 		Trial pit terminated on target depth.					
General Remarks:											
Relative density is approximate and determined by observation only.				Version: FINAL		Scale: 1:25					

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Trial Pit Log			Trial Pit No TP04 Sheet 1 of 1	
Site Name: Lychgate Lane, Burbage, Leicestershire							Ground Level (mAOD) 107.79	
Client: Avant Homes (Midlands)					GRM Project Ref: P10481		Coordinates 444844 E 292238 N	
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	D		0.22	107.57		Dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of mudstone and quartzite. TOPSOIL	
	0.10	ES					Firm, medium strength light yellowish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of mudstone and sandstone with rare flint. BOSWORTH CLAY MEMBER	
				0.60	107.19		Stiff, high strength dark orangish brown and occasionally light grey mottled slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of mudstone with rare quartzite, chalk and flint, including rare cobbles. BOSWORTH CLAY MEMBER	
	0.80	D	HVP=70				with rare 0.01m to 0.40m slightly damp pockets of clayey fine to medium sand, and sandy clay encountered between 0.60m and 2.60m depth. Clay is locally firm immediately around damp sand pockets.	
	0.80		HVP=80					
	0.80		HVP=80					
	1.00							
	1.50	D	HVP=120 HVP=120 HVP=120					
	1.50							
	1.50							
1.80	D							
2.00		HVP=120 HVP=120 HVP=120						
2.00								
2.00								
			3.00	104.79		End of Pit at 3.000m		
Date Excavated: 05/01/2024				Groundwater Observations:				
Date Backfilled: 05/01/2024				No groundwater encountered during excavation.				
Shoring: None.								
Stability: Remained stable.								
Plant Used: CAT 308 CR				Trial Pit Dimensions (m):		Reason for termination of Trial Pit:		
Logged by: AT				0.60 		Trial pit terminated on target depth.		
General Remarks:								
Relative density is approximate and determined by observation only.				Version: FINAL		Scale: 1:25		

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Trial Pit Log			Trial Pit No TP05 Sheet 1 of 1		
Site Name: Lychgate Lane, Burbage, Leicestershire							Ground Level (mAOD) 107.13		
Client: Avant Homes (Midlands)					GRM Project Ref: P10481			Coordinates 444801 E 292314 N	
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
	0.20	D		0.29	106.84		Dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of mudstone and quartzite. TOPSOIL		
	0.20	ES					Stiff, high strength light orangish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of quartzite, flint and mudstone including rare cobbles. BOSWORTH CLAY MEMBER <i>with rare 0.01m to 0.45m slightly damp pockets of clayey fine to medium sand, and sandy clay encountered between 0.29m and 1.40m depth.</i>		
	0.80	D	HVP=75 HVP=75 HVP=80	1.10	106.03		Stiff, high strength dark orangish brown and occasionally light grey mottled slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of mudstone with rare quartzite, chalk and flint, including rare cobbles. BOSWORTH CLAY MEMBER		
	0.80								
	0.80								
	0.90								
	1.20	D	HVP=110 HVP=120 HVP=90	2.40	104.73		Stiff, high strength dark brown slightly gravelly CLAY. Gravel is fine to medium and subrounded of mudstone of rare flint. BOSWORTH CLAY MEMBER		
	1.20								
	1.20								
	1.50								
	1.60	D	HVP=105 HVP=120 HVP=90	3.00	104.13		End of Pit at 3.000m		
	1.60								
2.30	D		2.40	104.73		Stiff, high strength dark brown slightly gravelly CLAY. Gravel is fine to medium and subrounded of mudstone of rare flint. BOSWORTH CLAY MEMBER			
2.30									
Date Excavated: 05/01/2024				Groundwater Observations:					
Date Backfilled: 05/01/2024				No groundwater encountered during excavation.					
Shoring: None.									
Stability: Remained stable.									
Plant Used: CAT 308 CR				Trial Pit Dimensions (m):		Reason for termination of Trial Pit:			
Logged by: AT				0.60 		Trial pit terminated on target depth.			
General Remarks:									
Relative density is approximate and determined by observation only.				Version: FINAL			Scale: 1:25		

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Trial Pit Log			Trial Pit No TP06 Sheet 1 of 1		
Site Name: Lychgate Lane, Burbage, Leicestershire							Ground Level (mAOD) 106.24		
Client: Avant Homes (Midlands)					GRM Project Ref: P10481		Coordinates 444862 E 292308 N		
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
	0.10	D		0.30	105.94		Dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of mudstone and quartzite. TOPSOIL		
	0.10	ES					Stiff, high strength light orangish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of quartzite, flint and mudstone including rare cobbles. BOSWORTH CLAY MEMBER <i>with a terracotta field drain encountered at 0.60m depth.</i>		
	0.80	D	HVP=75 HVP=75 HVP=80	0.90	105.34		Stiff, high strength dark brown slightly gravelly CLAY. Gravel is fine to medium and subrounded of mudstone of rare flint. BOSWORTH CLAY MEMBER End of Pit at 1.100m		
	0.80								
	0.80								
	1.10	D	HVP=100 HVP=105 HVP=98	1.10	105.14				
	1.10								
	1.10								
								1	
								2	
							3		
							4		
Date Excavated: 05/01/2024				Groundwater Observations:					
Date Backfilled: 05/01/2024				No groundwater encountered during excavation.					
Shoring: None.									
Stability: Remained stable.									
Plant Used: CAT 308 CR				Trial Pit Dimensions (m):		Reason for termination of Trial Pit:			
Logged by: AT				0.60 		Trial pit completed as a soakaway test pit.			
General Remarks:									
Relative density is approximate and determined by observation only.				Version: FINAL		Scale: 1:25			

Trial Pit Log

Trial Pit No

TP08

Sheet 1 of 1

Site Name: Lychgate Lane, Burbage, Leicestershire

Ground Level (mAOD)	
------------------------	--

105.24

Client: Avant Homes (Midlands)

GRM Project Ref: P10481

Coordinates

444937

E

292280

N

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10 0.10	D ES		0.22	105.02		Dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of mudstone and quartzite. TOPSOIL
	0.75 0.75 0.75		HVP=40 HVP=48 HVP=50				Firm, medium strength light yellowish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of mudstone and sandstone with rare flint. BOSWORTH CLAY MEMBER
	1.00 1.00 1.00 1.00 1.20 1.20 1.20 1.50	D D	HVP=50 HVP=50 HVP=55 HVP=70 HVP=75 HVP=80	1.10	104.14		Stiff, high strength locally firm, medium strength dark orangish brown and occasionally light grey mottled slightly sandy slightly gravelly CLAY with rare 2mm to 10mm carbonaceous pockets. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of mudstone with rare quartzite, chalk and flint, including rare cobbles. BOSWORTH CLAY MEMBER
	1.70 1.70 1.70		HVP=100 HVP=90 HVP=95	1.70	103.54		Stiff, high strength dark brown slightly gravelly CLAY. Gravel is fine to medium and subrounded of mudstone of rare flint. BOSWORTH CLAY MEMBER
	2.10	D					<i>with rare 0.05m to 0.30m pockets of slightly silty slightly gravelly fine to coarse sand encountered between 1.70m and 2.50m depth.</i> <i>Gravel is medium to coarse and subrounded of mudstone.</i>
				3.00	102.24		End of Pit at 3.000m

Date Excavated: 05/01/2024

Date Backfilled: 05/01/2024

Shoring: None.

Stability:	Remained stable.
-------------------	------------------

Plant Used: CAT 308 CR

Logged by: AT

Groundwater Observations:

No groundwater encountered during excavation.

Trial Pit Dimensions (m):

0.60

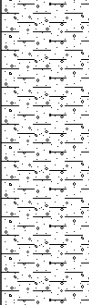
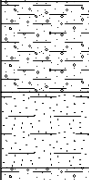
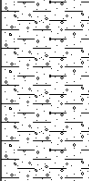
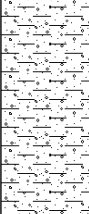
2.50

Reason for termination of Trial Pit:

Trial pit terminated on target depth.

General Remarks:	
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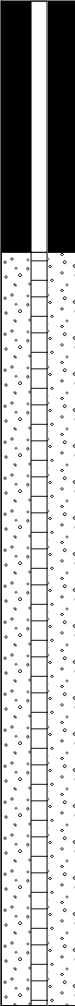
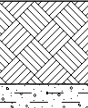
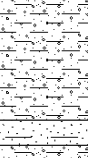
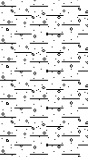
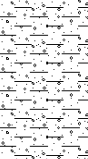
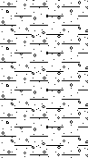
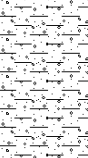
		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Trial Pit Log			Trial Pit No TP09 Sheet 1 of 1	
Site Name: Lychgate Lane, Burbage, Leicestershire							Ground Level (mAOD) 104.08	
Client: Avant Homes (Midlands)					GRM Project Ref: P10481		Coordinates 444954 E 292320 N	

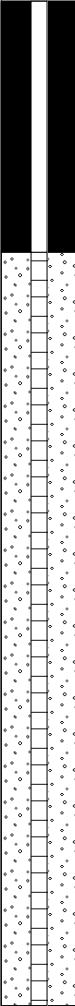
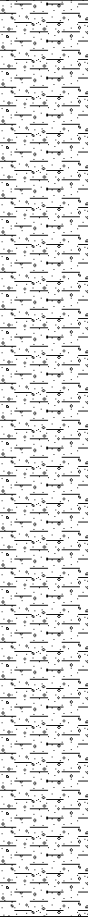
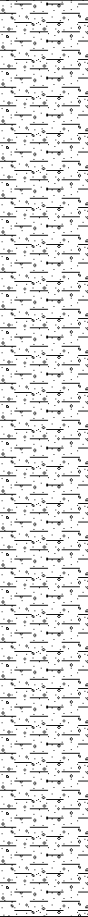
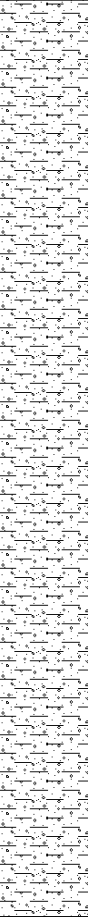
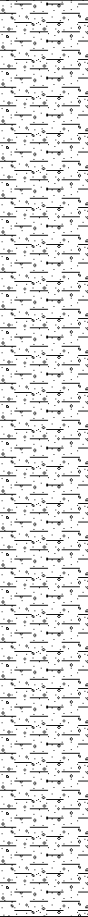
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	D		0.20	103.88		Dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of mudstone and quartzite.	1
	0.20	ES					TOPSOIL	
	0.80		HVP=50				Firm, medium strength light orangish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of quartzite, flint and mudstone including rare cobbles.	
	0.80		HVP=55				BOSWORTH CLAY MEMBER	
	0.80		HVP=60					
	1.10	D						
	1.20		HVP=48					
				1.30	102.78		Stiff, high strength dark orangish brown and occasionally light grey mottled slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of mudstone with rare quartzite, chalk and flint, including rare cobbles.	
	1.20		HVP=50				BOSWORTH CLAY MEMBER	
	1.20		HVP=60					
	1.40		HVP=100					
	1.40		HVP=80					
				1.60	102.48		Medium dense wet dark orangish brown slightly clayey fine to medium SAND.	2
	1.40	D	HVP=90				BOSWORTH CLAY MEMBER	
	1.80		HVP=100					
1.80		HVP=110						
1.80		HVP=110						
			1.85	102.23		Stiff, high strength dark orangish brown and occasionally light grey mottled slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of mudstone with rare quartzite, chalk and flint, including rare cobbles.	3	
2.00	D					BOSWORTH CLAY MEMBER		
						with rare 0.20m to 0.50m diameter boulders of mudstone encountered from 2.00m depth.		
2.50	D							
			3.20	100.88				
						End of Pit at 3.200m		4

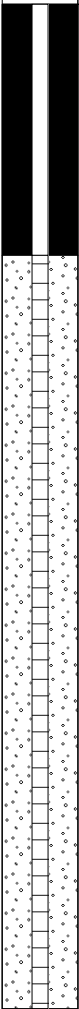
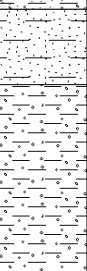
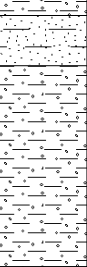
Date Excavated: 05/01/2024		Groundwater Observations:	
Date Backfilled: 05/01/2024		Perched groundwater encountered within a band of sand between 1.60m and 1.85m depth.	
Shoring: None.			
Stability: Collapse from 1.60m to surface.			
Plant Used: CAT 308 CR		Reason for termination of Trial Pit:	
Logged by: AT		Trial pit terminated on target depth.	
General Remarks:			

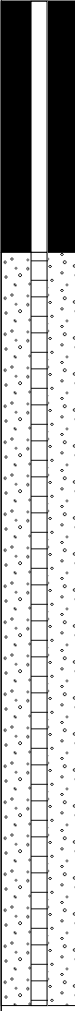
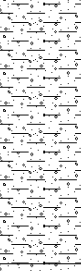
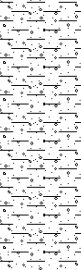
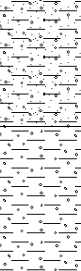
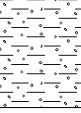
Relative density is approximate and determined by observation only.	Version: FINAL	Scale: 1:25
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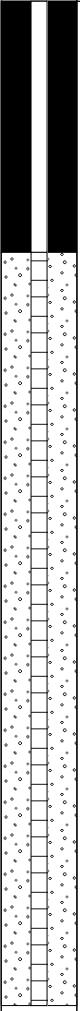
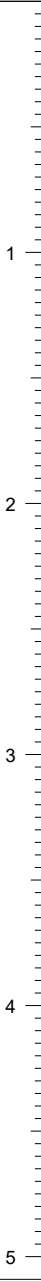
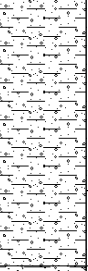
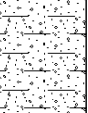
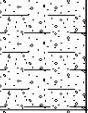
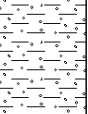
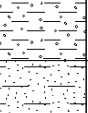
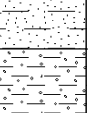
Scale: 1:25

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Windowless Sample Borehole			Borehole No WS02 Sheet 1 of 1		
Site Name: Lychgate Lane, Burbage, Leicestershire							Ground Level (mAOD) 108.40		
Client: Avant Homes (Midlands)					GRM Project Ref: P10481		Coordinates 444821 E 292227 N		
Installation/ Backfill	Water Strike	Samples/Tests			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth	Type	SPT Result					
		0.15	D		0.33	108.07		Dark brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of mudstone and quartzite. TOPSOIL	
		0.15	ES						
		0.80	D	HVP=85	0.90	107.50		Stiff, high strength dark orangish brown and occasionally light grey mottled slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of mudstone with rare quartzite, chalk and flint, including rare cobbles. BOSWORTH CLAY MEMBER	
		0.80	HV	HVP=90					
		0.80	HV	HVP=98					
		0.80	HV	N=13 (3,3/3,3,4,3)					
		1.00			1.00	107.40		Medium dense dark orangish brown clayey fine to medium SAND. BOSWORTH CLAY MEMBER	
		1.20	D						
		1.50	HV	HVP=70	2.00			Firm, medium strength, locally stiff, high strength dark orangish brown and occasionally light grey mottled slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of mudstone with rare quartzite, chalk and flint, including rare cobbles. BOSWORTH CLAY MEMBER	
		1.50	HV	HVP=78					
		1.50	HV	HVP=80					
		1.80	D						
		2.00		N=8 (2,2/2,2,2,2)	2.80			with rare rootlets between 0.33m and 0.90m depth. becoming sandy from 0.80m depth.	
2.80	D		3.00			becoming stiff, high strength from 3.00m depth.			
3.00		N=22 (3,4/5,6,6,5)							
3.80	D		4.00	104.40					
4.00		N=20 (5,6/5,5,5,5)							
						End of Borehole at 4.000m			
Crew: Dynamic Sampling UK Ltd. Logger: AT Weather: Overcast.									
Equipment: Premier Compact 110.									
Reason for termination of borehole: Borehole terminated on target depth.									
Groundwater Remarks: No groundwater encountered during drilling.									
General Remarks:									
Hole Started: 04/01/2024		Hole Complete: 04/01/2024		Version: FINAL		Scale: 1:31			

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Windowless Sample Borehole			Borehole No WS03 Sheet 1 of 1		
Site Name: Lychgate Lane, Burbage, Leicestershire							Ground Level (mAOD) 107.98		
Client: Avant Homes (Midlands)					GRM Project Ref: P10481			Coordinates 444816 E 292276 N	
Installation/ Backfill	Water Strike	Samples/Tests			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth	Type	SPT Result					
		0.20	D ES		0.35	107.63		Dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of mudstone and quartzite.	
		0.20						TOPSOIL	
		1.00	D HV HV HV	N=12 (3,2/3,3,3,3)				Firm, medium strength. locally stiff, high strength dark orangish brown and occasionally light grey mottled slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of mudstone with rare quartzite, chalk and flint, including rare cobbles.	
		1.10						BOSWORTH CLAY MEMBER	
		1.20						with rare rootlets between 0.35m and 1.00m depth.	
		1.20						with rare 0.01m to 0.04m slightly damp pockets of clayey fine to medium sand, and sandy clay encountered between 0.35m and 2.00m depth.	
		1.20	D	N=13 (3,3/3,4,3,3)					
		1.70							
		2.00							
		2.30	D	N=18 (3,4/4,4,5,5)				becoming stiff, high strength from 3.00m depth.	
3.00									
3.20									
4.00		N=20 (5,5/5,5,5,5)	4.00	103.98		End of Borehole at 4.000m			
									5
Crew: Dynamic Sampling UK Ltd.				Logger: AT			Weather: Overcast.		
Equipment: Premier Compact 110.									
Reason for termination of borehole: Borehole terminated on target depth.									
Groundwater Remarks: No groundwater encountered during drilling.									
General Remarks:									
Hole Started: 04/01/2024		Hole Complete: 04/01/2024			Version: FINAL		Scale: 1:31		

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Windowless Sample Borehole				Borehole No WS04 Sheet 1 of 1			
Site Name: Lychgate Lane, Burbage, Leicestershire								Ground Level (mAOD) 106.44			
Client: Avant Homes (Midlands)					GRM Project Ref: P10481				Coordinates 444870 E 292267 N		
Installation/ Backfill	Water Strike	Samples/Tests			Depth (m)	Level (m)	Legend	Stratum Description			
		Depth	Type	SPT Result							
		0.10	D		0.28	106.16		Dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of mudstone and quartzite. TOPSOIL			
		0.10	ES								
		0.90	D	HVP=78	1.90	104.54		Stiff, high strength dark orangish brown and occasionally light grey mottled slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of mudstone with rare quartzite, chalk and flint, including rare cobbles. BOSWORTH CLAY MEMBER			
		0.90	HV	HVP=80							
		0.90	HV	HVP=85							
		0.90	HV	N=11 (3,3/4,2,2,3)							
		1.00									
		1.50	D		2.20	104.24		Medium dense wet dark orangish brown slightly clayey fine to medium SAND. BOSWORTH CLAY MEMBER <i>with rare 0.01m to 0.04m slightly damp pockets of clayey fine to medium sand, and sandy clay encountered between 2.00m and 3.20m depth.</i>			
		2.00		N=15 (2,3/3,3,4,5)							
		2.30	D								
			3.00		N=18 (3,3/5,5,4,4)	3.00	103.44		Stiff, high strength dark brown slightly gravelly CLAY. Gravel is fine to medium and subrounded of mudstone of rare flint. BOSWORTH CLAY MEMBER		
			3.20								
			3.90	D		4.00	102.44		Medium dense dark brown slightly clayey fine to medium SAND. BOSWORTH CLAY MEMBER Stiff, high strength dark brown slightly gravelly CLAY. Gravel is fine to medium and subrounded of mudstone of rare flint. BOSWORTH CLAY MEMBER		
		4.00		N=26 (5,5/7,6,7,6)							
									End of Borehole at 4.000m		
Crew: Dynamic Sampling UK Ltd.				Logger: AT			Weather: Overcast.				
Equipment: Premier Compact 110.											
Reason for termination of borehole: Borehole terminated on target depth.											
Groundwater Remarks: Perched groundwater encountered within a band of sand between 1.90m and 2.20m depth, and between 3.00m and 3.20m depth.											
General Remarks:											
Hole Started: 04/01/2024		Hole Complete: 04/01/2024		Version: FINAL		Scale: 1:31					

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Windowless Sample Borehole			Borehole No WS05 Sheet 1 of 1		
Site Name: Lychgate Lane, Burbage, Leicestershire							Ground Level (mAOD) 104.26		
Client: Avant Homes (Midlands)					GRM Project Ref: P10481			Coordinates 444962 E 292270 N	
Installation/ Backfill	Water Strike	Samples/Tests			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth	Type	SPT Result					
		0.20	D		0.30	103.96		Dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of mudstone and quartzite. TOPSOIL	
		0.20	ES						
		0.80	HV	HVP=75	1.40	102.86		Stiff, high strength, locally firm, medium strength light yellowish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of mudstone and sandstone. BOSWORTH CLAY MEMBER	
		0.80	HV	HVP=78					
		0.80	HV	HVP=80					
		0.90	D	N=11 (2,2/3,3,3,2)					
		1.00							
		1.30	D						
		1.60	HV	HVP=65	2.00	101.26		Firm, medium strength dark orangish brown and occasionally light grey mottled slightly sandy slightly gravelly CLAY with rare 2mm to 10mm carbonaceous pockets. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of mudstone with rare quartzite, chalk and flint, including rare cobbles. BOSWORTH CLAY MEMBER <i>with rare 0.01m to 0.04m slightly damp pockets of clayey fine to medium sand, and sandy clay encountered between 1.40m and 3.00m depth. gravel is rare from 2.00m depth.</i>	
		1.60	HV	HVP=70					
		1.60	HV	HVP=75					
		1.80	D						
		2.00		N=13 (2,3/3,3,4,3)					
		2.40	D						
		3.00		N=10 (2,2/2,2,3,3)	3.00	101.26		Firm, medium strength dark brown slightly gravelly CLAY. Gravel is fine to medium and subrounded of mudstone of rare flint. BOSWORTH CLAY MEMBER	
3.50	D								
4.00		N=17 (4,4/5,4,4,4)	4.00	100.26		becoming stiff, high strength from 3.90m depth. End of Borehole at 4.000m			
Crew: Dynamic Sampling UK Ltd.			Logger: AT			Weather: Overcast.			
Equipment: Premier Compact 110.									
Reason for termination of borehole: Borehole terminated on target depth.									
Groundwater Remarks: No groundwater encountered during drilling.									
General Remarks:									
Hole Started: 04/01/2024			Hole Complete: 04/01/2024			Version: FINAL		Scale: 1:31	

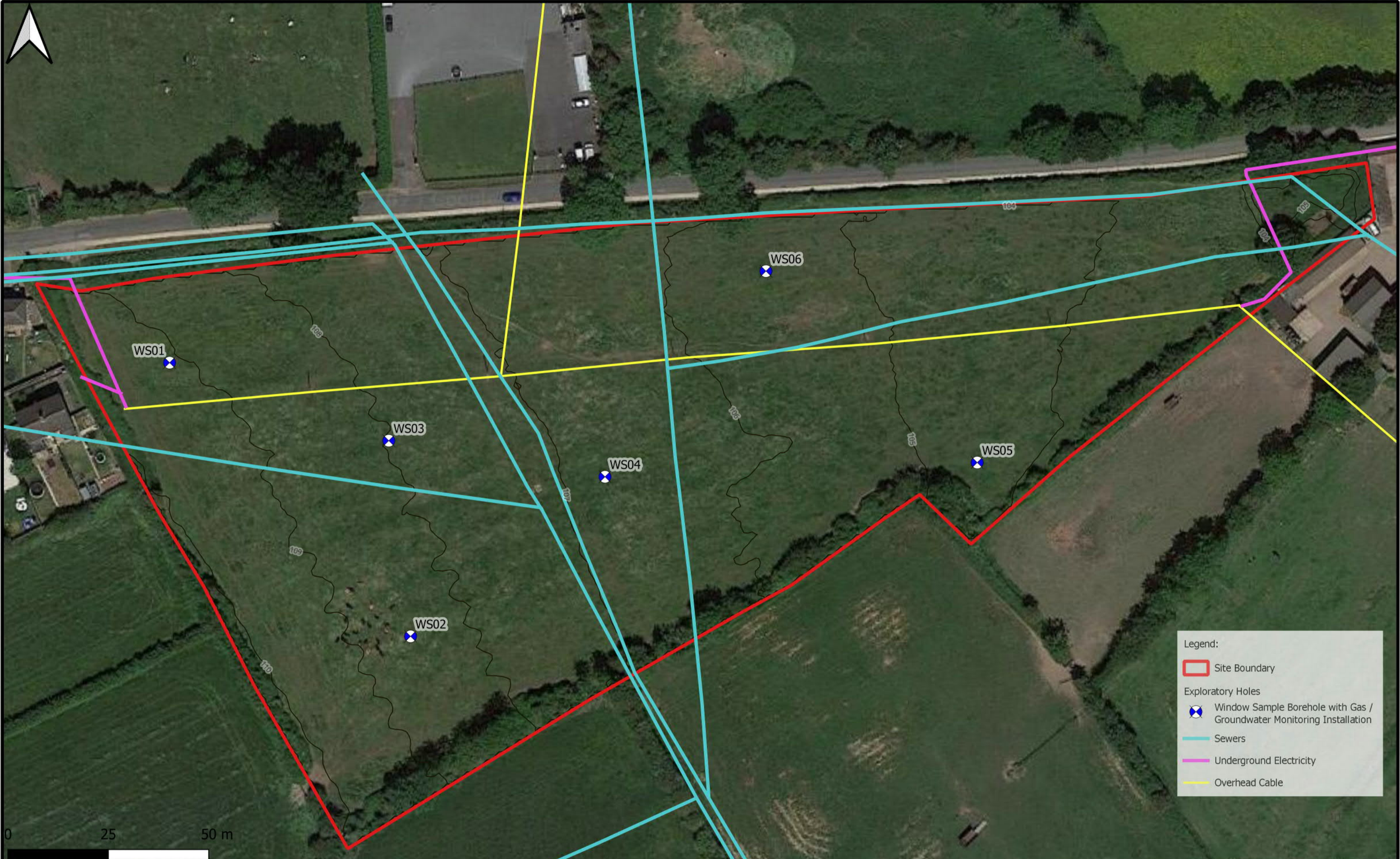
		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Windowless Sample Borehole			Borehole No WS06 Sheet 1 of 1		
Site Name: Lychgate Lane, Burbage, Leicestershire							Ground Level (mAOD) 105.12		
Client: Avant Homes (Midlands)					GRM Project Ref: P10481		Coordinates 444910 E 292318 N		
Installation/ Backfill	Water Strike	Samples/Tests			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth	Type	SPT Result					
		0.20 0.20	D ES		0.33	104.79	 Dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of mudstone and quartzite. TOPSOIL		
		1.00 1.00	D	N=11 (2,2/3,3,3,2)			 Firm, medium strength light yellowish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse and subrounded to subangular of mudstone and sandstone with rare flint. BOSWORTH CLAY MEMBER		
		1.20 1.20 1.20 1.40	HV HV HV D	HVP=68 HVP=70 HVP=78			 <i>becoming sandy and gravelly from 1.20m depth.</i>		
		2.00		N=10 (3,2/2,3,3,2)			 Medium dense wet light orangish brown slightly clayey and locally clayey slightly gravelly fine to medium SAND. Gravel is fine to coarse and subrounded to subangular of mudstone and sandstone with rare flint. BOSWORTH CLAY MEMBER		
		2.50 2.50 2.50 2.70	HV HV HV D	HVP=75 HVP=78 HVP=80			 Stiff, high strength dark brown slightly gravelly CLAY. Gravel is fine to medium and subrounded of mudstone of rare flint. BOSWORTH CLAY MEMBER		
		3.00		N=11 (2,2/2,2,3,4)			 Medium dense wet dark brown slightly clayey fine to medium SAND. BOSWORTH CLAY MEMBER		
		3.70	D				 Stiff, high strength dark brown slightly gravelly CLAY. Gravel is fine to medium and subrounded of mudstone of rare flint. BOSWORTH CLAY MEMBER		
		4.00		N=17 (4,4/5,4,4,4)			 End of Borehole at 4.000m		
Crew: Dynamic Sampling UK Ltd.			Logger: AT			Weather: Overcast.			
Equipment: Premier Compact 110.									
Reason for termination of borehole: Borehole terminated on target depth.									
Groundwater Remarks: Perched groundwater encountered within a band of sand between 1.50m and 2.40m depth, and between 3.10m and 3.50m depth.									
General Remarks:									
Hole Started: 04/01/2024		Hole Complete: 04/01/2024		Version: FINAL		Scale: 1:31			



A P P E N D I X F

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



Legend:

- Site Boundary
- Exploratory Holes
 - Window Sample Borehole with Gas / Groundwater Monitoring Installation
- Sewers
- Underground Electricity
- Overhead Cable

NOTES: Notes	CLIENT: Avant Homes (Midlands)	PROJECT No: P10481	DATE: January 2024	DESIGN/DRAWN: AT	 GRM Development Solutions Ltd Tel: 01283 551 249 mail@grm-uk.comwww.grm-uk.com
	PROJECT: Lychgate Lane, Burbage, Leicestershire	DRAWING NUMBER: Figure 4		ISSUE: Final	
	TITLE: Gas Monitoring Plan	© GRM Development Solutions Ltd © Crown Copyright. AL 100014100			



A P P E N D I X G

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GRM Development Solutions Limited, Laurus House, First Avenue, Centrum 100, Burton upon Trent, Staffs DE14 2WH
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In-Situ Gas Monitoring Results

Project Name Lychgate Lane, Burbage
Project Number P10481
Client Avant Homes (Midlands)
Date 15/01/2024
Weather Sunny
Atmospheric Pressure (mb) 1011
Pressure Trend Rising
Equipment Gas Data GFM436
Operator James Wardle

Ground Gas													
Well ID	Response Zone			Methane		CO2		Oxygen		Gas Flow		PID Reading	
	mbegl			%v/v		%v/v		%v/v		l/h		ppm	
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady
WS01	1.0	4.0	NS	0.0	0.0	0.2	0.2	19.5	19.5	0.0	0.0	Not Recorded	
WS02	1.0	4.0	NS	0.0	0.0	0.7	0.7	19.4	19.4	0.0	0.0	Not Recorded	
WS03	1.0	4.0	NS	0.0	0.0	0.1	0.1	19.7	19.7	0.0	0.0	Not Recorded	
WS04	1.0	4.0	NS	0.0	0.0	0.5	0.5	19.7	19.7	0.0	0.0	Not Recorded	
WS05	1.0	4.0	NS	0.0	0.0	0.6	0.6	19.7	19.7	0.0	0.0	Not Recorded	
WS06	1.0	4.0	NS	Not Recorded		Not Recorded		Not Recorded		Not Recorded		Not Recorded	

Groundwater	
Depth to Groundwater	Total Well Depth
mbegl	mbegl
1.1	3.9
2.8	3.8
0.9	3.9
0.6	4.0
0.9	3.8
0.5	3.5

Notes

L.E.L. Lower Explosive Limit (100% L.E.L.= 5% Flammable Gas)
N.D. Not Detected
N.R. Not Recorded
PID Photo-Ionising Detector
% By volume

a Methane => 1% v/v
b Carbon Dioxide =>5% v/v
MG Made Ground
NS Natural Strata

Ground Material Key

NS Natural Strata

Key

Response Zone Flooded



In-Situ Gas Monitoring Results

Project Name	Lychgate Lane, Burbage
Project Number	P10481
Client	Avant Homes (Midlands)
Date	23/01/2024
Weather	Rain
Atmospheric Pressure (mb)	1007
Pressure Trend	Falling
Equipment	Gas Data GFM436
Operator	Liam Press

Ground Gas													
Well ID	Response Zone			Methane		CO2		Oxygen		Gas Flow		PID Reading	
	mbegl			%v/v		%v/v		%v/v		l/h		ppm	
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady
WS01	1.0	4.0	NS	0.0	0.0	0.0	0.0	19.4	19.4	0.0	0.0	Not Recorded	
WS02	1.0	4.0	NS	0.0	0.0	0.0	0.0	19.6	19.6	0.0	0.0	Not Recorded	
WS03	1.0	4.0	NS	0.0	0.0	0.4	0.4	19.3	19.3	0.0	0.0	Not Recorded	
WS04	1.0	4.0	NS	0.0	0.0	0.3	0.3	19.4	19.4	0.0	0.0	Not Recorded	
WS05	1.0	4.0	NS	0.0	0.0	0.0	0.0	19.5	19.5	0.0	0.0	Not Recorded	
WS06	1.0	4.0	NS	0.0	0.0	0.0	0.0	19.6	19.6	0.0	0.0	Not Recorded	

Groundwater	
Depth to Groundwater	Total Well Depth
mbegl	mbegl
1.0	4.0
0.8	3.9
2.3	3.9
0.5	4.0
0.3	3.9
0.4	3.4

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L.= 5% Flammable Gas)		
N.D.	Not Detected	a	Methane => 1% v/v
N.R.	Not Recorded	b	Carbon Dioxide =>5% v/v
PID	Photo-Ionising Detector	MG	Made Ground
%	By volume	NS	Natural Strata

Ground Material Key

NS Natural Strata

Key

 Response Zone Flooded



A P P E N D I X H

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

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www.grm-uk.com | info@grm-uk.com | 01283 551249 Company No. 3099018 (England), VAT Reg. No. 658 1005 48



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7 - 11 Harding Street
Leicester
LE1 4DH

GRM Development Solutions

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

Analytical Test Report: L24/00157/GRM - 24-40556

Your Project Reference:	Lychgate Lane, Burbage P10481		
Your Order Number:	P10481	Samples Received / Instructed:	08/01/2024 / 08/01/2024
Report Issue Number:	1	Sample Tested:	08/01 to 16/01/2024
Samples Analysed:	15 soil samples	Report issued:	16/01/2024

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 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.

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: 30.10.2023

Issued by: J. Gane

Issue No: 4

Rev No: 5



L24/00157/GRM - 24-40556

Project Reference - Lychgate Lane, Burbage P10481

Analytical Test Results - Solid

Lab Reference			334849	334850	334851	334852	334853	334854	334855
Client Sample ID			-	-	-	-	-	-	-
Client Sample Location			WS01	WS02	WS03	WS05	WS06	TP01	TP07
Client Sample Type			ES	ES	ES	ES	ES	ES	ES
Client Sample Number			-	-	-	-	-	-	-
Depth - Top (m)			0.15	0.15	0.20	0.20	0.20	0.80	0.80
Depth - Bottom (m)			0.15	0.15	0.20	0.20	0.20	0.80	0.80
Date of Sampling			04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024	05/01/2024	05/01/2024
Time of Sampling			-	-	-	-	-	-	-
Sample Matrix			Loam	Loam	Loam	Loam	Loam	Clay	Clay
Determinant	Units	Accreditation							
Arsenic	(mg/kg)	MCERTS	10	10	11	14	18	< 10	13
Cadmium	(mg/kg)	MCERTS	0.6	0.8	0.7	1.1	1.2	0.6	0.9
Chromium (Total)	(mg/kg)	UKAS	13	16	20	35	24	15	20
Copper	(mg/kg)	MCERTS	22	23	23	28	53	23	20
Lead	(mg/kg)	MCERTS	61	61	66	64	170	11	18
Mercury	(mg/kg)	UKAS	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5
Nickel	(mg/kg)	MCERTS	18	19	18	20	30	27	31
Selenium	(mg/kg)	u	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
Zinc	(mg/kg)	MCERTS	87	86	93	130	180	36	64
Total Phenols	(mg/kg)	MCERTS	< 1.0	< 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	< 1.0
Chromium (Hexavalent)	(mg/kg)	u	< 1.0	2.0	2.4	< 1.0	< 1.0	< 1.0	< 1.0
pH	pH Units	MCERTS	6.3	6.0	6.0	6.3	6.4	8.5	7.8
Sulphate (Water soluble as SO ₄)	(mg/l)	u	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Acenaphthene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Acenaphthylene	(mg/kg)	UKAS	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Anthracene	(mg/kg)	UKAS	0.04	0.03	< 0.02	0.05	< 0.02	< 0.02	< 0.02
Benzo (a) anthracene	(mg/kg)	MCERTS	0.46	0.25	0.26	0.20	0.21	< 0.02	< 0.02
Benzo (a) pyrene	(mg/kg)	MCERTS	0.33	0.20	0.24	0.18	0.18	< 0.02	< 0.02
Benzo (b) fluoranthene	(mg/kg)	MCERTS	0.61	0.38	0.47	0.33	0.39	< 0.02	< 0.02
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	0.22	0.13	0.19	0.16	0.14	< 0.02	< 0.02
Benzo (k) fluoranthene	(mg/kg)	MCERTS	0.18	0.10	0.14	0.10	0.12	< 0.02	< 0.02
Chrysene	(mg/kg)	MCERTS	0.40	0.23	0.27	0.20	0.23	< 0.02	< 0.02
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	0.03	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Fluoranthene	(mg/kg)	MCERTS	0.71	0.36	0.37	0.34	0.33	< 0.02	< 0.02
Fluorene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Indeno (1, 2, 3-cd) pyrene	(mg/kg)	MCERTS	0.23	0.14	0.18	0.16	0.14	< 0.02	< 0.02
Naphthalene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Phenanthrene	(mg/kg)	MCERTS	0.12	0.09	0.09	0.16	0.10	< 0.02	< 0.02
Pyrene	(mg/kg)	MCERTS	0.64	0.34	0.35	0.30	0.31	< 0.02	< 0.02
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	4.1	2.4	2.7	2.3	2.3	< 0.32	< 0.32
SOM (via TOC)	(%)	UKAS	6.5	6.7	8.3	10	10	< 1.7	< 1.7



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L24/00157/GRM - 24-40556

Project Reference - Lychgate Lane, Burbage P10481

Analytical Test Results - Solid

Lab Reference	334856
---------------	--------

Client Sample ID	-
Client Sample Location	TP10
Client Sample Type	ES
Client Sample Number	-
Depth - Top (m)	0.75
Depth - Bottom (m)	0.75
Date of Sampling	05/01/2024
Time of Sampling	-
Sample Matrix	Clay

Determinant	Units	Accreditation	
Arsenic	(mg/kg)	MCERTS	11
Cadmium	(mg/kg)	MCERTS	0.7
Chromium (Total)	(mg/kg)	UKAS	14
Copper	(mg/kg)	MCERTS	21
Lead	(mg/kg)	MCERTS	32
Mercury	(mg/kg)	UKAS	< 2.5
Nickel	(mg/kg)	MCERTS	23
Selenium	(mg/kg)	u	< 8.0
Zinc	(mg/kg)	MCERTS	71
Total Phenols	(mg/kg)	MCERTS	< 1.0
Cyanide (Total)	(mg/kg)	MCERTS	< 1.0
Chromium (Hexavalent)	(mg/kg)	u	< 1.0
pH	pH Units	MCERTS	7.1
Sulphate (Water soluble as SO ₄)	(mg/l)	u	< 10
Acenaphthene	(mg/kg)	MCERTS	< 0.02
Acenaphthylene	(mg/kg)	UKAS	< 0.02
Anthracene	(mg/kg)	UKAS	< 0.02
Benzo (a) anthracene	(mg/kg)	MCERTS	< 0.02
Benzo (a) pyrene	(mg/kg)	MCERTS	< 0.02
Benzo (b) fluoranthene	(mg/kg)	MCERTS	< 0.02
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	< 0.02
Benzo (k) fluoranthene	(mg/kg)	MCERTS	< 0.02
Chrysene	(mg/kg)	MCERTS	< 0.02
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	< 0.02
Fluoranthene	(mg/kg)	MCERTS	< 0.02
Fluorene	(mg/kg)	MCERTS	< 0.02
Indeno (1, 2, 3,-cd) pyrene	(mg/kg)	MCERTS	< 0.02
Naphthalene	(mg/kg)	MCERTS	< 0.02
Phenanthrene	(mg/kg)	MCERTS	< 0.02
Pyrene	(mg/kg)	MCERTS	< 0.02
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	< 0.32
SOM (via TOC)	(%)	UKAS	2.4



L24/00157/GRM - 24-40556

Project Reference - Lychgate Lane, Burbage P10481

Analytical Test Results - Chemical Analysis

Lab Reference			334857	334858	334859	334860	334861	334862	334863
Client Sample ID			-	-	-	-	-	-	-
Client Sample Location			WS01	WS03	WS05	TP03	TP06	TP07	TP09
Client Sample Type			D	D	D	D	D	D	D
Client Sample Number			-	-	-	-	-	-	-
Depth - Top (m)			1.50	2.30	1.80	0.85	0.80	2.80	1.50
Depth - Bottom (m)			1.50	2.30	1.80	0.85	0.80	2.80	1.50
Date of Sampling			04/01/2024	04/01/2024	04/01/2024	05/01/2024	05/01/2024	05/01/2024	05/01/2024
Time of Sampling			-	-	-	-	-	-	-
Sample Matrix			Clay	Clay	Clay	Clay	Clay	Clay	Clay
Determinant	Units	Accreditation							
Water soluble sulphate (as SO ₄)	(mg/l)	u	26	10	< 10	15	< 10	16	17
pH Value	pH Units	MCERTS	8.4	8.5	8.4	8.2	7.4	8.2	8.2



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L24/00157/GRM - 24-40556

Project Reference - Lychgate Lane, Burbage P10481

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 (%)
334849	-	WS01	ES	-	Brown slightly gravelly sandy clay loam with frequent organic matter	34	< 0.1	84
334850	-	WS02	ES	-	Brown slightly gravelly sandy clay loam with frequent organic matter	34	< 0.1	79
334851	-	WS03	ES	-	Brown slightly gravelly sandy clay loam with frequent organic matter	43	< 0.1	92
334852	-	WS05	ES	-	Brown slightly gravelly sandy clay loam with frequent organic matter	57	< 0.1	67
334853	-	WS06	ES	-	Brown slightly gravelly sandy clay loam with frequent organic matter	46	< 0.1	76
334854	-	TP01	ES	-	Brown slightly gravelly sandy clay	16	< 0.1	89
334855	-	TP07	ES	-	Brown slightly gravelly sandy clay	21	< 0.1	90
334856	-	TP10	ES	-	Brown slightly gravelly sandy silty clay	24	< 0.1	72
334857	-	WS01	D	-	Brown slightly gravelly silty clay	-	-	55
334858	-	WS03	D	-	Brown slightly gravelly silty clay	-	-	59
334859	-	WS05	D	-	Brown slightly gravelly silty clay	-	-	75
334860	-	TP03	D	-	Brown slightly gravelly sandy clay	-	-	52
334861	-	TP06	D	-	Brown slightly gravelly sandy clay with rare rootlets	-	-	55
334862	-	TP07	D	-	Brown sandy silty clay	-	-	67
334863	-	TP09	D	-	Brown gravelly sandy silty clay	-	-	57



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L24/00157/GRM - 24-40556

Project Reference - Lychgate Lane, Burbage P10481

Sample Comments

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Comments
334849	-	WS01	ES	-	
334850	-	WS02	ES	-	
334851	-	WS03	ES	-	
334852	-	WS05	ES	-	
334853	-	WS06	ES	-	
334854	-	TP01	ES	-	
334855	-	TP07	ES	-	
334856	-	TP10	ES	-	
334857	-	WS01	D	-	
334858	-	WS03	D	-	
334859	-	WS05	D	-	
334860	-	TP03	D	-	
334861	-	TP06	D	-	
334862	-	TP07	D	-	
334863	-	TP09	D	-	



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L24/00157/GRM - 24-40556

Project Reference - Lychgate Lane, Burbage P10481

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
SAMPLEPREP	MS - CL - Sample Preparation	-	-	Preparation of samples (including determination of moisture content) to allow for subsequent analysis



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L24/00157/GRM - 24-40556

Project Reference - Lychgate Lane, Burbage P10481

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

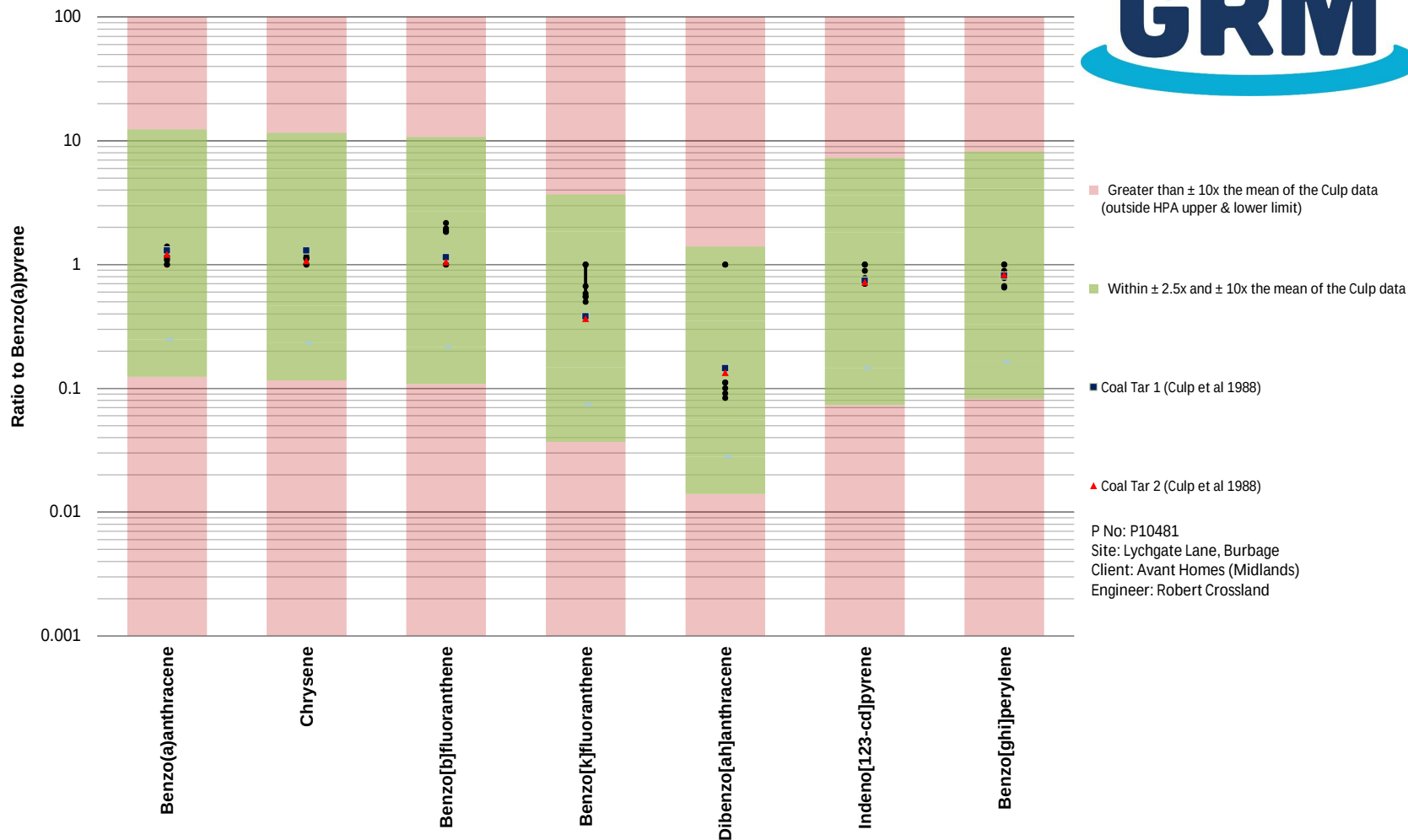
R - Sample(s) received with less than 96 hours for testing to commence/complete, any result formally classed as deviating will be marked with an X against the applicable test (i.e. RX)

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
334849	-	WS01	ES	-	MS - CL - pH in Soils	R
334850	-	WS02	ES	-	MS - CL - pH in Soils	R
334851	-	WS03	ES	-	MS - CL - pH in Soils	R
334852	-	WS05	ES	-	MS - CL - pH in Soils	R
334853	-	WS06	ES	-	MS - CL - pH in Soils	R
334857	-	WS01	D	-	MS - CL - pH in Soils	R
334858	-	WS03	D	-	MS - CL - pH in Soils	R
334859	-	WS05	D	-	MS - CL - pH in Soils	R

PAH Mixture Analysis





A P P E N D I X I

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

TEST REPORT

Client GRM Development Solutions Ltd

Address Laurus House
1st Avenue
Centrum 100
Burton-on-Trent
Staffordshire
DE14 2WH

Contract Lychgate Lane,
Burbage

Job Number MRN 24007/5

Date of Issue 19 January 2024

Page 1 of 8

Approved Signatories

S J Hutchings, O P Davies

Notes

- 1 All remaining samples and remnants from this contract will be disposed 28 days from the date of this report unless you notify us to the contrary.
- 2 Result certificates, in this report, not bearing a UKAS mark, are not included in our UKAS accreditation schedule.
- 3 Opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.
- 4 Certified that the samples have been examined and tested in accordance with the terms of the contract/order and unless otherwise stated conform to the standards/specifications quoted.
- 5 The results included within the report are representative of the samples submitted for analysis.
- 6 This certificate should not be reproduced, except in full, without the express permission of the laboratory.



Andrew House, Hadfield Street, Dukinfield, Cheshire SK16 4QX Tel: 0161 475 0870
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DUKINFIELD, CHESHIRE SK16 4QX
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TEST CERTIFICATE

LIQUID LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.3 (30° FALL CONE) 1 POINT METHOD

PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5

WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

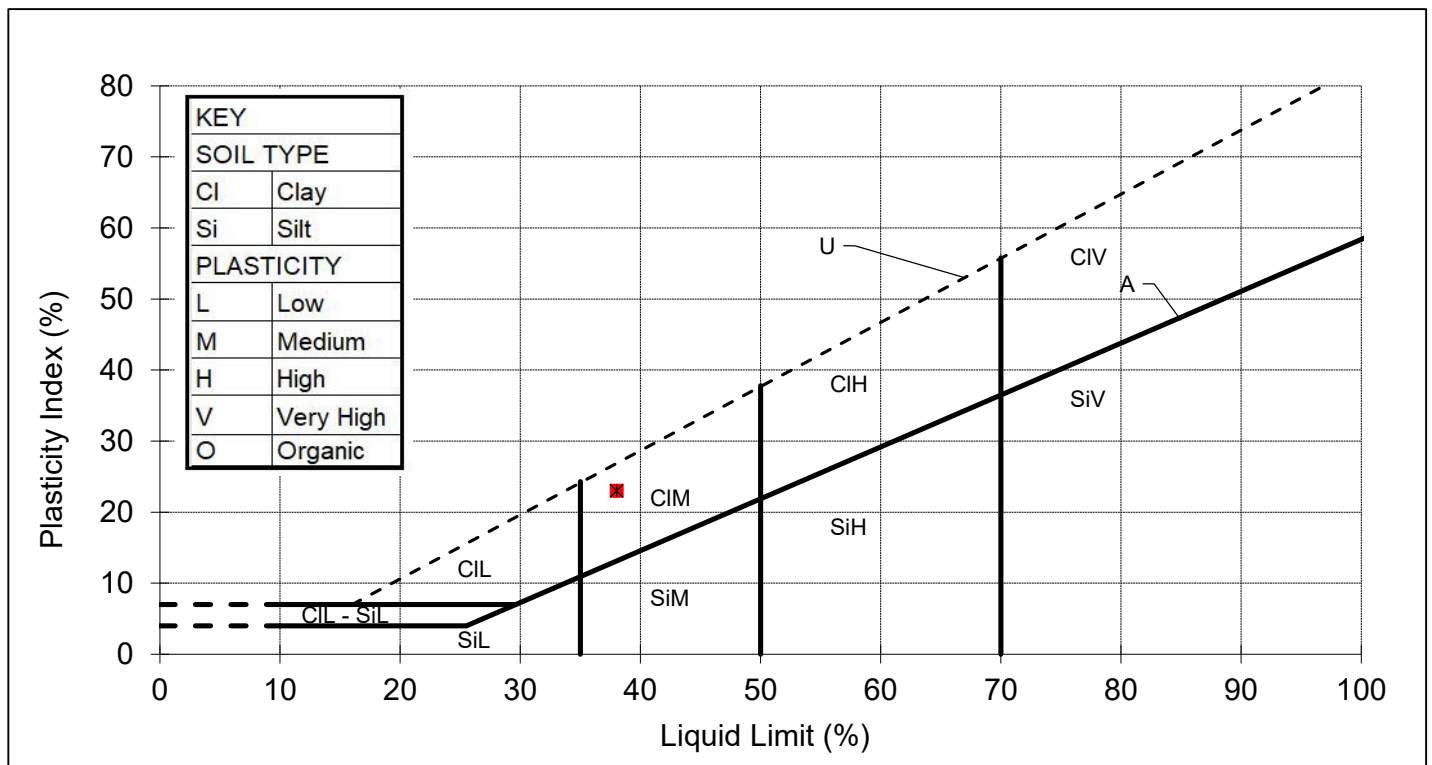
CLIENT	GRM Development Solutions Ltd		
SITE	Lychgate Lane, Burbage		
JOB NUMBER	MRN 24007/5		

SAMPLE LABEL	WS01 - 0.9m	DATE SAMPLED	04-Jan-24
SAMPLE No.	404801	DATE RECEIVED	10-Jan-24
DATE TESTED	15-Jan-24	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Wet Sieved

Test Readings mm (average)		Moisture Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	19.5	37.5	1.007	
Determination 2 (avg)	19.8	38.0		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
20.4	38	15	23	85



REMARKS

SIGNED

NAME

O.P. Davies BA (Hons)
(Laboratory Manager)

DATE

19-Jan-24

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870



TEST CERTIFICATE

LIQUID LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.3 (30° FALL CONE) 1 POINT METHOD

PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5

WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

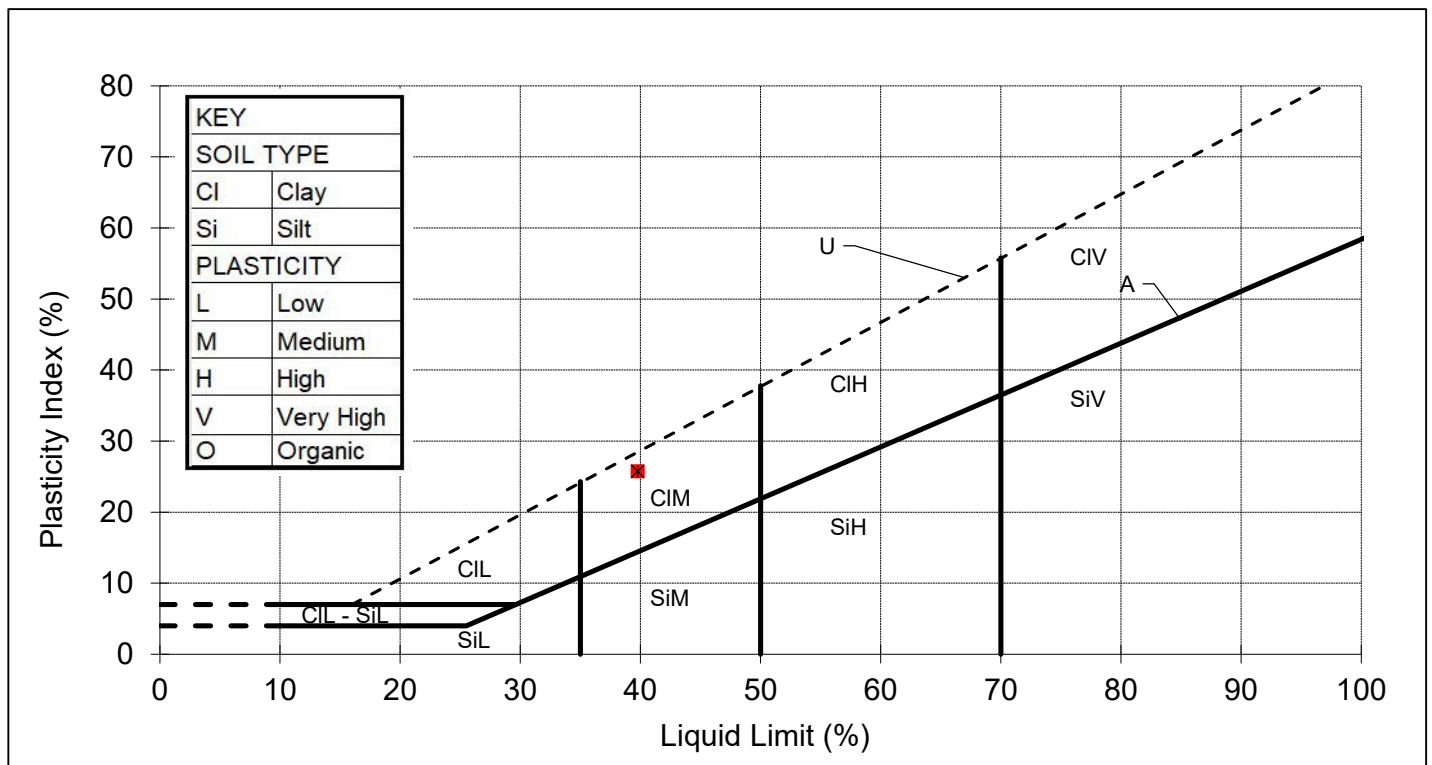
CLIENT	GRM Development Solutions Ltd		
SITE	Lychgate Lane, Burbage		
JOB NUMBER	MRN 24007/5		

SAMPLE LABEL	WS03 - 1.7m	DATE SAMPLED	04-Jan-24
SAMPLE No.	404802	DATE RECEIVED	10-Jan-24
DATE TESTED	15-Jan-24	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Wet Sieved

Test Readings mm (average)		Moisture Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	17.5	38.1	1.043	
Determination 2 (avg)	17.6	38.2		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
18.4	40	14	26	81



REMARKS

SIGNED

NAME

O.P. Davies BA (Hons)
(Laboratory Manager)

DATE

19-Jan-24

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870



TEST CERTIFICATE

LIQUID LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.3 (30° FALL CONE) 1 POINT METHOD

PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5

WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

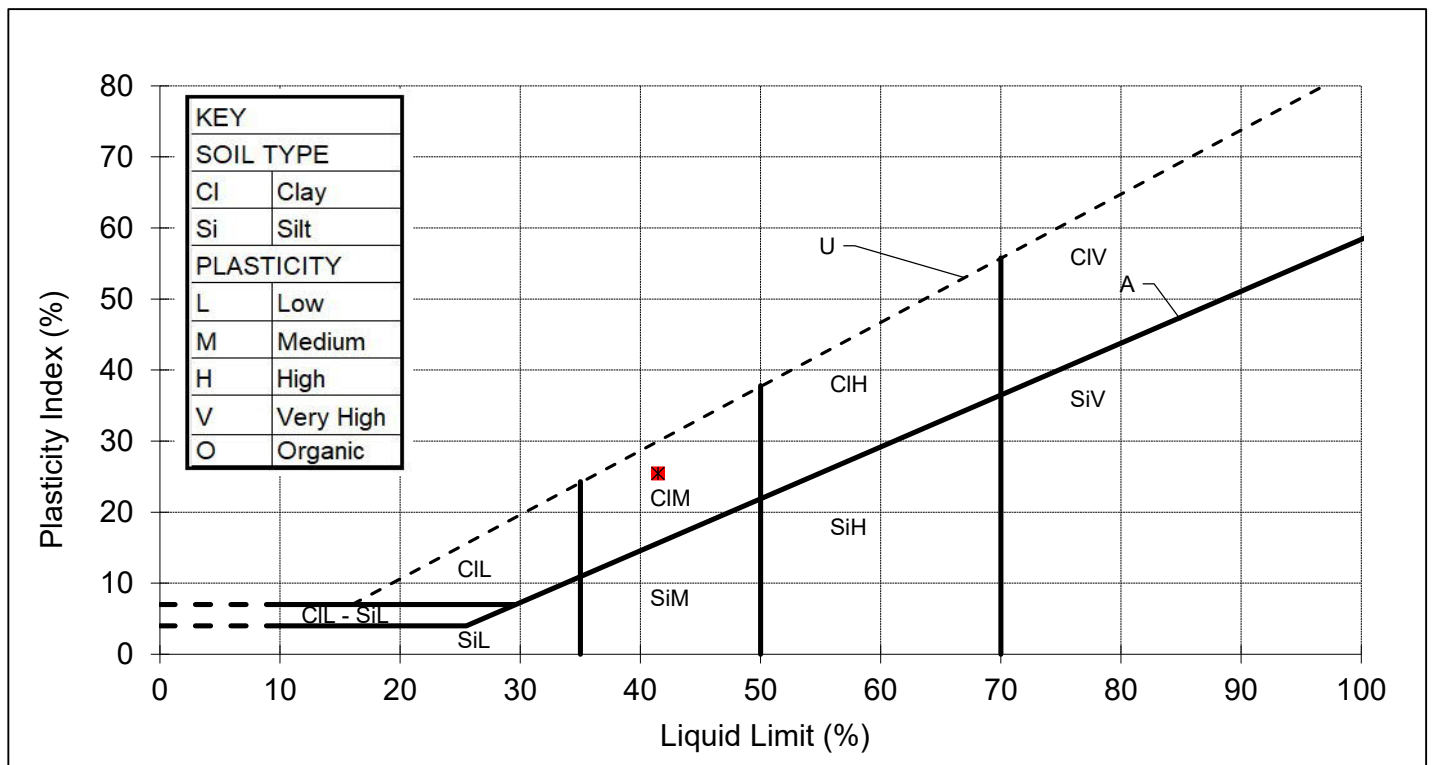
CLIENT	GRM Development Solutions Ltd		
SITE	Lychgate Lane, Burbage		
JOB NUMBER	MRN 24007/5		

SAMPLE LABEL	WS05 - 1.3m	DATE SAMPLED	04-Jan-24
SAMPLE No.	404803	DATE RECEIVED	10-Jan-24
DATE TESTED	15-Jan-24	SAMPLED BY	Client

MATERIAL	Grey brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Wet Sieved

Test Readings mm (average)		Moisture Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	18.2	40.0	1.037	
Determination 2 (avg)	18.0	40.0		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
24.3	41	16	25	90



REMARKS

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(Laboratory Manager)

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19-Jan-24

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LIQUID LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.3 (30° FALL CONE) 1 POINT METHOD

PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5

WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

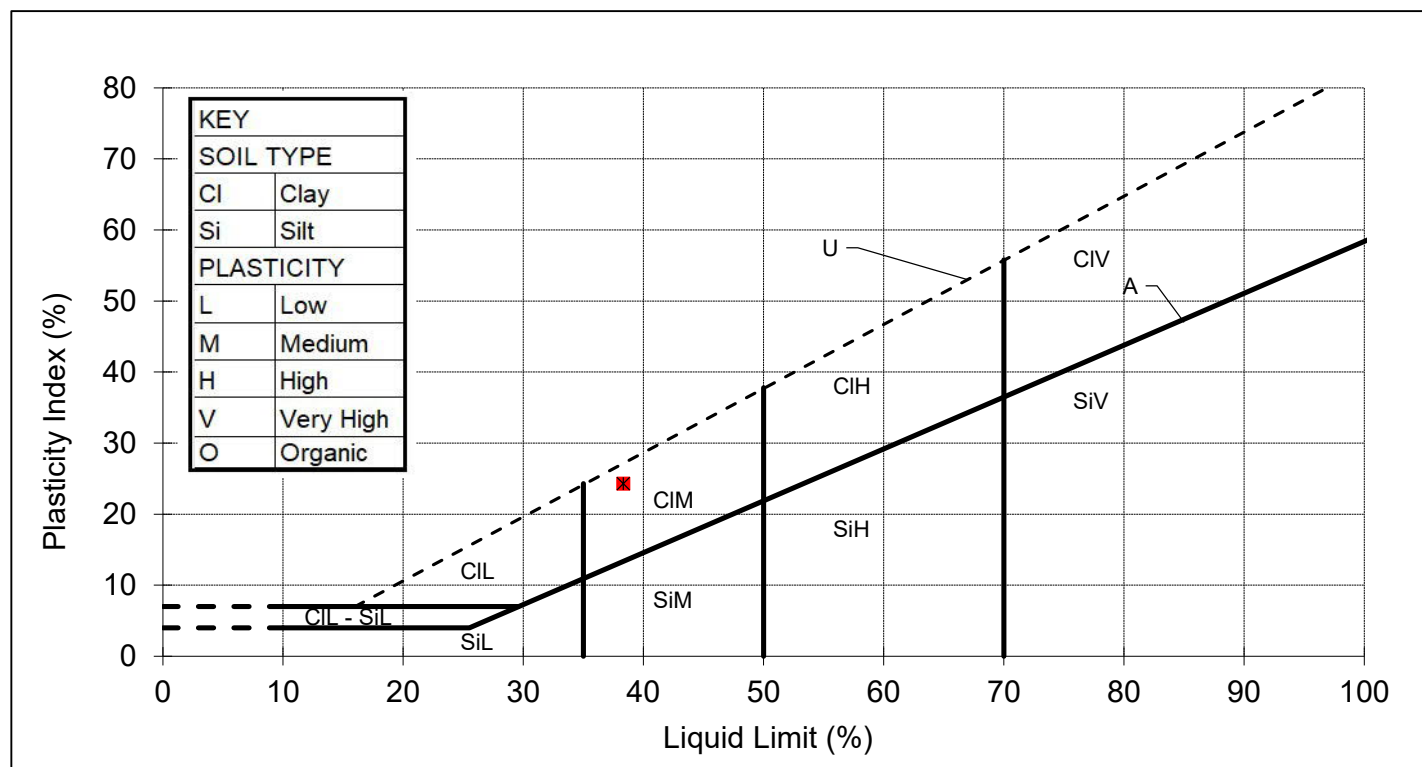
CLIENT	GRM Development Solutions Ltd
SITE	Lychgate Lane, Burbage
JOB NUMBER	MRN 24007/5

SAMPLE LABEL	TP03 - 2.4m	DATE SAMPLED	05-Jan-24
SAMPLE No.	404804	DATE RECEIVED	10-Jan-24
DATE TESTED	15-Jan-24	SAMPLED BY	Client

MATERIAL	Grey brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Wet Sieved

Test Readings mm (average)		Moisture Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	17.5	36.8	1.044	
Determination 2 (avg)	17.5	36.6		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
20.3	38	14	24	88



REMARKS

SIGNED

NAME

O.P. Davies BA (Hons)
(Laboratory Manager)

DATE

19-Jan-24

MURRAY RIX

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DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870



TEST CERTIFICATE

LIQUID LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.3 (30° FALL CONE) 1 POINT METHOD

PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5

WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

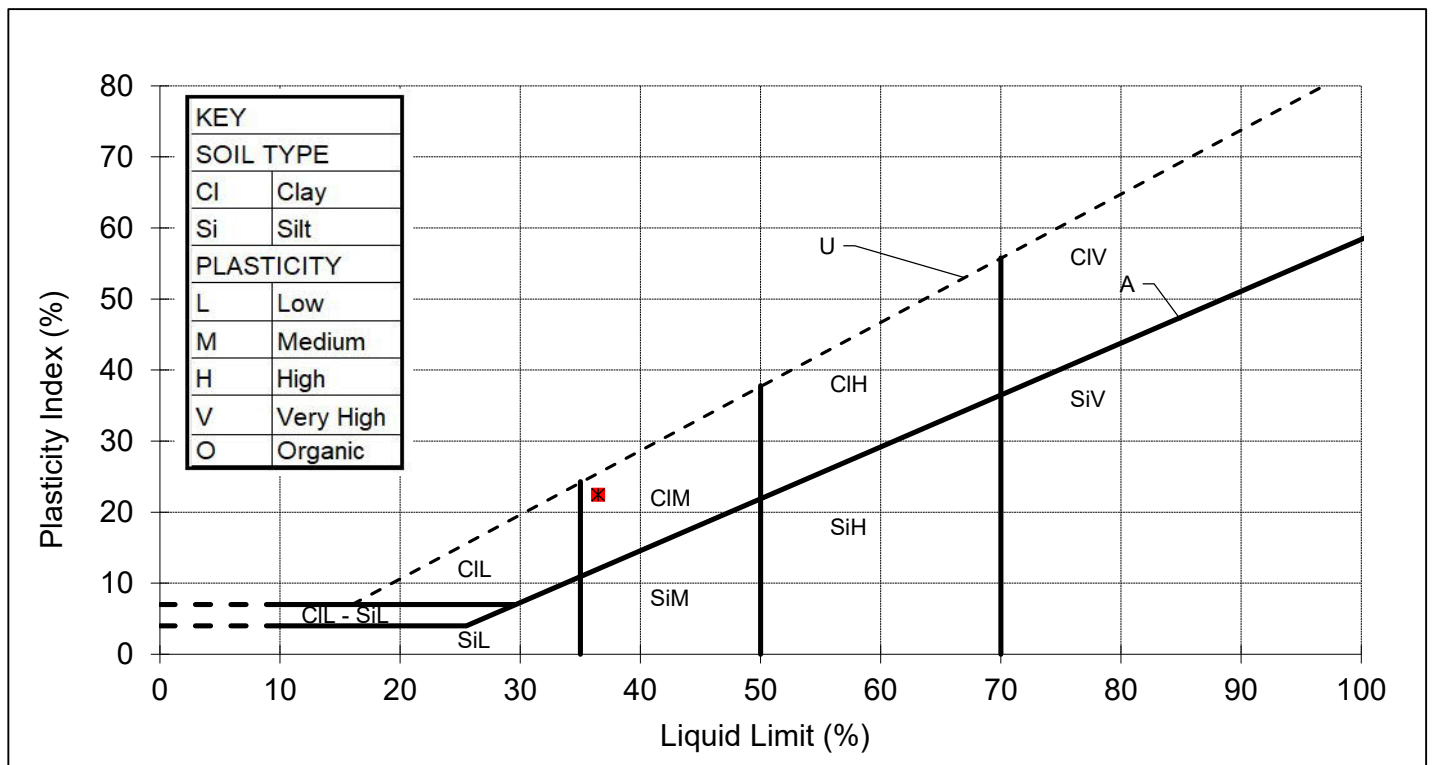
CLIENT	GRM Development Solutions Ltd		
SITE	Lychgate Lane, Burbage		
JOB NUMBER	MRN 24007/5		

SAMPLE LABEL	TP06 - 1.1m	DATE SAMPLED	05-Jan-24
SAMPLE No.	404805	DATE RECEIVED	10-Jan-24
DATE TESTED	15-Jan-24	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Wet Sieved

Test Readings mm (average)		Moisture Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	19.5	36.1	1.010	
Determination 2 (avg)	19.5	36.1		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
20.1	36	14	22	85



REMARKS

SIGNED

NAME

O.P. Davies BA (Hons)
(Laboratory Manager)

DATE

19-Jan-24

MURRAY RIX

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DUKINFIELD, CHESHIRE SK16 4QX
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TEST CERTIFICATE

LIQUID LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.3 (30° FALL CONE) 1 POINT METHOD

PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5

WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

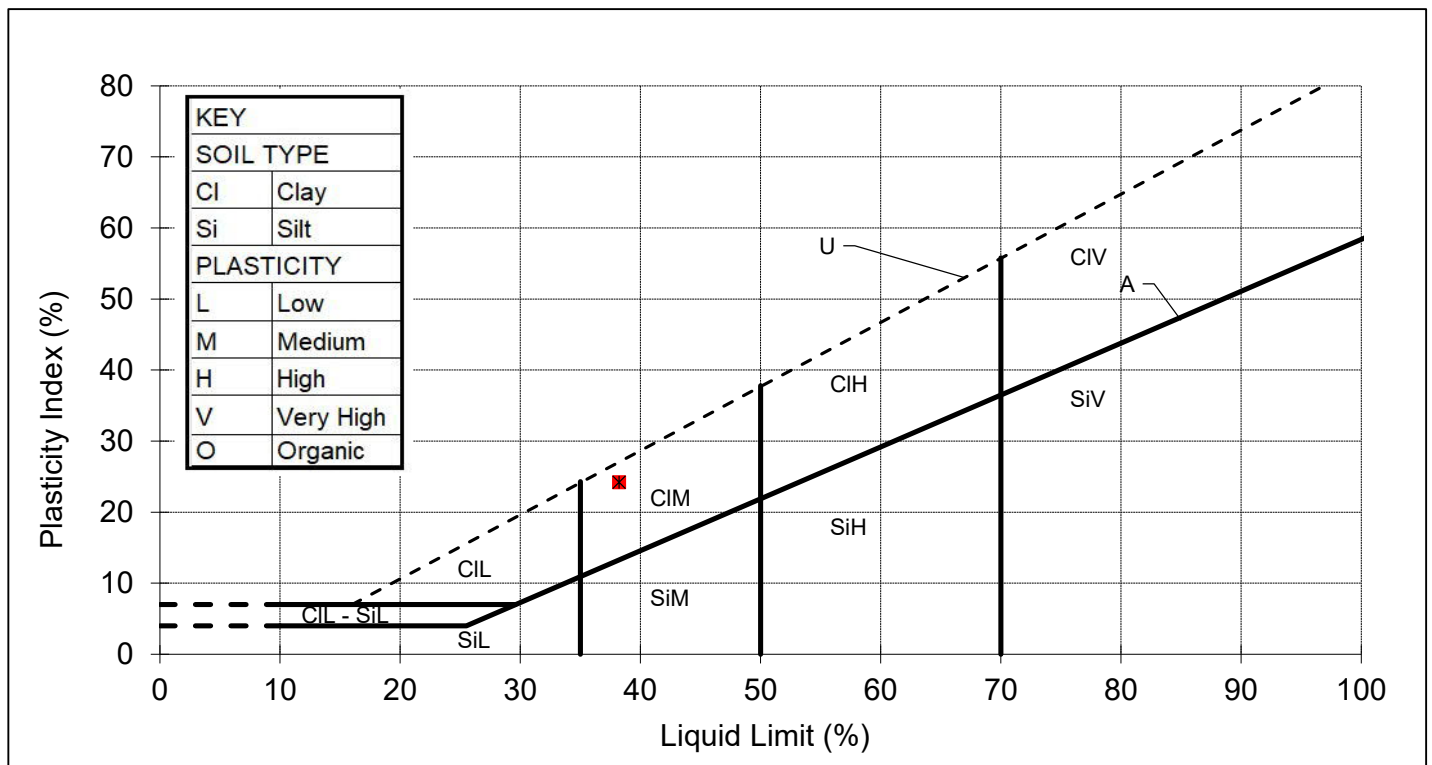
CLIENT	GRM Development Solutions Ltd		
SITE	Lychgate Lane, Burbage		
JOB NUMBER	MRN 24007/5		

SAMPLE LABEL	TP07 - 1.7m	DATE SAMPLED	05-Jan-24
SAMPLE No.	404806	DATE RECEIVED	10-Jan-24
DATE TESTED	15-Jan-24	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Wet Sieved

Test Readings mm (average)		Moisture Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	18.7	37.5	1.023	
Determination 2 (avg)	18.6	37.2		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
19.8	38	14	24	86



REMARKS

SIGNED

NAME

O.P. Davies BA (Hons)
(Laboratory Manager)

DATE

19-Jan-24

MURRAY RIX

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DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870



TEST CERTIFICATE

LIQUID LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.3 (30° FALL CONE) 1 POINT METHOD

PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5

WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

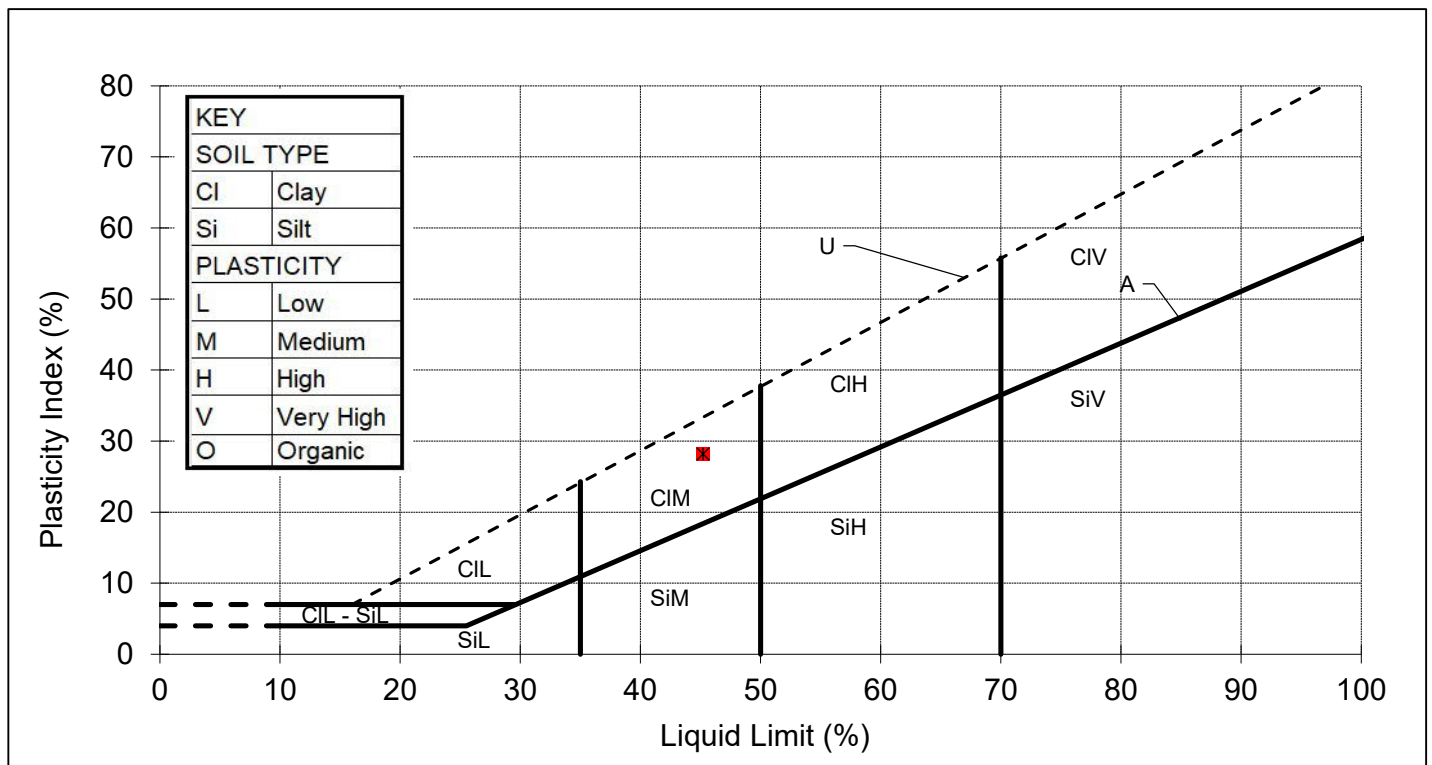
CLIENT	GRM Development Solutions Ltd		
SITE	Lychgate Lane, Burbage		
JOB NUMBER	MRN 24007/5		

SAMPLE LABEL	TP09 - 2.0m	DATE SAMPLED	05-Jan-24
SAMPLE No.	404807	DATE RECEIVED	10-Jan-24
DATE TESTED	15-Jan-24	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Wet Sieved

Test Readings mm (average)		Moisture Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	20.1	45.3	1.000	
Determination 2 (avg)	20.0	45.1		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
25.0	45	17	28	77



REMARKS

SIGNED

NAME

O.P. Davies BA (Hons)
(Laboratory Manager)

DATE

19-Jan-24



A P P E N D I X J

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

	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

Contaminant Thresholds for Subsurface Water Pipes

Contaminant	Thresholds (mg/kg)
Corrosion	
Wrapped Steel	pH<7 Cond >400µS/cm
Wrapped Ductile Iron	pH<5 Cond >400µS/cm, he not neutral
Copper	pH<5 >8 and Eh +ve
Toxic Substances	
Chromium (total) (Cr)	Applies to above pipe materials
Organic Contaminants	
VOC's	0.5 PE/0.125 PVC
BTEX & MTBE	0.1 PE/0.03 PVC
SVOC	2 PE/1.4 PVC
Phenols	2 PE/0.4 PVC
Cresols & Chlorinated Phenols	2 PE/0.04 PVC
Mineral Oil C11-C20	10 PE
Mineral Oil C21 - C40	500
Ether/Ketone/Amines, Nitrobenzene/Aldehydes	0.5 PE/0.02-1 PVC

Notes.

It is not recommended that water pipes should be laid in sites where these substances are identified or suspected

Local Utility Companies should be consulted prior to pipe specifications being finalised.

Ref: Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites. UKWIR Ref. No. 10/WM/03/21. 2010.



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Waste Classification Report

HazWasteOnline™ classifies waste as either **hazardous** or **non-hazardous** based on its chemical composition, related legislation and the rules and data defined in the current UK or EU technical guidance (Appendix C) (note that HP 9 Infectious is not assessed). It is the responsibility of the classifier named below to:

- understand the origin of the waste
- select the correct List of Waste code(s)
- confirm that the list of determinands, results and sampling plan are fit for purpose
- select and justify the chosen metal species (Appendix B)
- correctly apply moisture correction and other available corrections
- add the meta data for their user-defined substances (Appendix A)
- check that the classification engine is suitable with respect to the national destination of the waste (Appendix C)



A214J-4KMT2-IGY8G

To aid the reviewer, the laboratory results, assumptions and justifications managed by the classifier are highlighted in pale yellow.

Job name

P10481 Lychgate Lane, Burbage - Topsoil

Description/Comments

Project

P10481

Site

Lychgate Lane, Burbage -

Classified by

Name: **George Salloway**
 Date: **19 Jan 2024 09:34 GMT**
 Telephone: **01283 551 249**
 Company: **GRM Development Solutions Ltd**
Laurus House
First Avenue
Burton on Trent
DE14 2WH

HazWasteOnline™ provides a two day, hazardous waste classification course that covers the use of the software and both basic and advanced waste classification techniques. Certification has to be renewed every 3 years.

HazWasteOnline™ Certification:

CERTIFIED

Course

Hazardous Waste Classification
 Most recent 3 year Refresher

Date

06 Dec 2018
 07 Dec 2021

Next 3 year Refresher due by Dec 2024

Purpose of classification

2 - Material Characterisation

Address of the waste

Lychgate Lane, Burbage, Leicestershire, LE10 2DR

Post Code **N/ALE10 2DR**

SIC for the process giving rise to the waste

41202 Construction of domestic buildings

Description of industry/producer giving rise to the waste

Construction

Description of the specific process, sub-process and/or activity that created the waste

Excavation of soils, in preparation for new building

Description of the waste

Topsoil



Job summary

#	Sample name	Depth [m]	Classification Result	Hazard properties	Page
1	WS01	0.15	Non Hazardous		3
2	WS02	0.15	Non Hazardous		5
3	WS03	0.2	Non Hazardous		7
4	WS05	0.2	Non Hazardous		9
5	WS06	0.2	Non Hazardous		11

Related documents

#	Name	Description
1	GRM Validation Suite - WM3 V1.2.GB	waste stream template used to create this Job

Report

Created by: George Salloway

Created date: 19 Jan 2024 09:34 GMT

Appendices	Page
Appendix A: Classifier defined and non GB MCL determinands	13
Appendix B: Rationale for selection of metal species	14
Appendix C: Version	14

Waste Classification Report

HazWasteOnline™ classifies waste as either **hazardous** or **non-hazardous** based on its chemical composition, related legislation and the rules and data defined in the current UK or EU technical guidance (Appendix C) (note that HP 9 Infectious is not assessed). It is the responsibility of the classifier named below to:

- understand the origin of the waste
- select the correct List of Waste code(s)
- confirm that the list of determinands, results and sampling plan are fit for purpose
- select and justify the chosen metal species (Appendix B)
- correctly apply moisture correction and other available corrections
- add the meta data for their user-defined substances (Appendix A)
- check that the classification engine is suitable with respect to the national destination of the waste (Appendix C)



O2D91-BTGH8-SSFIQ

To aid the reviewer, the laboratory results, assumptions and justifications managed by the classifier are highlighted in pale yellow.

Job name

P10481 - Lychgate Lane, Burbage - Natural Strata

Description/Comments

Project

P10481

Site

Lychgate Lane, Burbage

Classified by

Name: **George Salloway**
 Date: **19 Jan 2024 09:40 GMT**
 Telephone: **01283 551 249**
 Company: **GRM Development Solutions Ltd**
Laurus House
First Avenue
Burton on Trent
DE14 2WH

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HazWasteOnline™ Certification:

CERTIFIED

Course

Hazardous Waste Classification
 Most recent 3 year Refresher

Date

06 Dec 2018
 07 Dec 2021

Next 3 year Refresher due by Dec 2024

Purpose of classification

2 - Material Characterisation

Address of the waste

Lychgate Lane, Burbage, Leicestershire, LE10 2DR

Post Code **LE10 2DR**

SIC for the process giving rise to the waste

41202 Construction of domestic buildings

Description of industry/producer giving rise to the waste

Construction.

Description of the specific process, sub-process and/or activity that created the waste

Excavation of soils, in preparation for new building.

Description of the waste

Natural strata.



Job summary

#	Sample name	Depth [m]	Classification Result	Hazard properties	Page
1	TP01	0.8	Non Hazardous		3
2	TP07	0.8	Non Hazardous		5
3	TP10	0.75	Non Hazardous		7

Related documents

#	Name	Description
1	GRM Validation Suite - WM3 V1.2.GB	waste stream template used to create this Job

Report

Created by: George Salloway

Created date: 19 Jan 2024 09:40 GMT

Appendices	Page
Appendix A: Classifier defined and non GB MCL determinands	9
Appendix B: Rationale for selection of metal species	10
Appendix C: Version	10



GRM

We understand land

GRM provide specialist ground, environmental, structural and design services for landowners and developers across the UK.

Our experience spans a wide range of sectors including private residential, social housing, healthcare, education, commercial, and industrial. Our sole aim is to maximise the potential of the site and thereby the commercial return for our clients.

Land Appraisal

Phase I Desk Studies | Phase II Site Investigations
Soakaway Testing | Specialist Land Surveys

Environmental

Preliminary Risk Assessments | Detailed Quantitative Risk Assessments
Ground Gas Assessments | Material Management Plans
Environmental Impact Assessments & Reports
Remediation Strategies & Validation | Due Diligence Audits

Geotechnical

Geotechnical Investigations | Earthworks | Slope Stability
Retaining Wall Design | Ground Stability | Vibration Assessments
Value Engineering

Design

Budget Foundation Schedules | Detailed Foundation Design
Structural Design | Structural Surveys

Mining

Coal Mining Risk Assessments | Coal Mining Investigations | Treatment of
Mine Workings | Mine Shafts | Subsidence | Mineral Resource Assessments

Site Services

Foundation Inspections | Gas Membrane Verification
Remediation Validation | Structural Inspections

We also work with key partners to deliver a range of other support services and surveys including topographical, ecology, tree, archaeological, flood risk, and utilities.

Please contact us for an informal discussion on how we can save both time and money on your development project:

www.grm-uk.com | 01283 551249 | info@grm-uk.com