LAND OFF WORKHOUSE LANE, BURBAGE, HINCKLEY

PHASE II SITE APPRAISAL REPORT FOR MATHER JAMIE

Project Ref:
P9013

Date:
August 2023

Prepared for:
Mather Jamie
3 Bank Court
Weldon Road
Loughborough
LE11 5RF

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.

Prepared by:	Project Manager	Reviewed by:	Approved by:
Amy McKenna BSc (Hons) MSc FGS (Engineering Geologist) amy.mckenna@grm-uk.com	**Lewis Gibbs** BSc (Hons) FGS (Senior Geotechnical Engineer) richard.hodgkinson@grm-uk.com	**Paul Wardle** BSc (Hons) MA FGS (Acting Principal Geologist) paul.wardle@grm-uk.com	**Geoff Beckett** BSc (Hons) CGeol (Director) geoff.beckett@grm-uk.com
When required in-house geological, geotechnical, environmental, structural and civil staff helped to produce this document.			

Issue	Description of Revision	Signature

Site Appraisal for Land off Workhouse Lane, Burbage, Hinckley

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 gardens, soft landscaping and infrastructure.	
CONTAMINATION ASSESSMENT - REMEDIATION / WASTE DISPOSAL		
End Users	An allowance for the removal or relocation of some topsoil to less sensitive areas (POS) until additional pesticide analysis is undertaken would be prudent.	Y
Site Workers	No remediation required.	
Construction Materials	Appropriate concrete specification. PE water supply pipes required (to be confirmed.	Y
Groundwater	Remediation unlikely to be required.	
Surface Water	Remediation unlikely to be required.	
Waste Disposal	Preliminary Waste Classification: Non-Hazardous for topsoil. Inert for natural strata. Will need to be confirmed by receiving landfill.	Y
GEOTECHNICAL ASSESSMENT – FOUNDATIONS		
Ground Treatment Required	In area of spring use of haul road, track matting or other form of protection.	
Main Bearing Strata	Clay estimated across 90% of site and sand over remaining 10%.	
Nett Allowable Bearing Pressure	110kN/m^2 (Clay & Sand). To be confirmed by a specialist for piles.	Y
Rockhead	Not encountered.	
Tree Influence	Some. Extent to be confirmed by a tree survey.	Y
Volume Change Potential	Medium.	
Likely Foundation Types	70% Strip/Trench Fill with some dig and pour and reinforcement required and 30% Piled (20% pile due to possible shallow groundwater and granular strata and 10% due to trees).	Y
Likely Foundation Depth Range	0.9m begl minimum, 2.5m begl maximum depths; typical depth 2.0m begl. To be confirmed by piling contractor for piles.	Y
Excavation Hazards	Possible shallow groundwater. Locally instability in granular deposits.	
Floor Slab Types	80% cast in-situ suspended and 20% beam and block.	
Gas Protection Requirements Radon and/or Landfill	No gas protection measures required. To be confirmed with LA. No radon protection required.	Y
GEOTECHNICAL ASSESSMENT - GENERAL		
Slope Stability Risk	Low.	
Soakaways Potential	Not suitable.	
New Access Roads	Observational CBRs 2% to 4% in cohesive soils and c.5% in natural granular soils.	Y
Buried Concrete Class	DS - 1; AC-1. GEN-1 (unreinforced), RC35 (reinforced).	
Retaining Walls and Boundary Features	None existing. Unlikely as part of proposed.	
Further Assessment Targets	Additional pesticide analysis to confirm level of risk. Completion of groundwater monitoring. Trial pitting to assess possible shallowing of foundations and better delineation around WS05, spring and marshy ground. Cable percussive boreholes for pile design.	Y
Other Comments	Flood Risk Assessment required. Tree survey required. Drainage design to consider current spring, boggy area and off-site ponds. Possible lining of future drainage ponds.	Y

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.

TABLE OF CONTENTS

1 INTRODUCTION....1
2 PHASE I DESK STUDY SUMMARY....3
3 PHASE II GROUND INVESTIGATION....9
4 LABORATORY ANALYSES RATIONALE....16
5 QUANTITATIVE RISK ASSESSMENT – HUMAN HEALTH (SOIL)....17
6 QUANTITATIVE RISK ASSESSMENT – HUMAN HEALTH (GROUND GAS)....19
7 QUANTITATIVE RISK ASSESSMENT - CONTROLLED WATERS....19
8 PHASE II CONCEPTUAL SITE MODEL....21
9 REMEDIATION....22
10 GEOTECHNICAL ASSESSMENT....25
11 FURTHER INVESTIGATION....32
12 CONCLUSIONS....32

APPENDICES

General Appraisal Comments and Standard Limitations	Appendix A
Phase I Ground Hazard Diagram	Appendix B
Exploratory Hole Location Plan	Appendix C
Exploratory Hole Logs	Appendix D
Groundwater Monitoring Plan & groundwater logger data graphs	Appendix E
Chemical Analysis Results	Appendix F
Geotechnical Test Results	Appendix G
GRM Contaminant Screening Values	Appendix H
Post GI Hazard Plan	Appendix I

1 INTRODUCTION

1.1 PREAMBLE

GRM Development Solutions Limited (GRM) has been appointed by Mather Jamie (Client) to undertake a Phase II Site Appraisal. A previous desk study by GRM (Phase I Desk Study, GRM/P9013/DS.1, July 2019) formed Phase I of the assessment and allowed the geotechnical and geo-environmental setting of the site to be determined and the identification of areas of particular concern that required targeted investigation. The Phase II works undertaken previously by WSP and recently by GRM reported within this document comprise the intrusive ground investigation, geotechnical testing and chemical analysis. The information gained from the Phase II works will be used to refine the conceptual model for the site and determine cost-effective development solutions.

The primary aim of the WSP investigation (Workhouse Lane, Burbage – Ground Investigation, ref: 70060615-L01, dated 14th November 2019) was to assess the groundwater conditions at the site and provide infiltration data to support a viability assessment for soakaway drainage.

As part of the Phase II Site Appraisal, GRM were asked to determine the extent of the water-bearing strata identified by WSP including the use of electronic data-loggers, and undertake chemical testing of the shallow soils.

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 residential properties with associated gardens, soft landscaping and infrastructure. At the time of writing a development layout was not available.

The Client has not informed GRM of any potential development hazard.

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.

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 Workhouse Lane, Burbage, Hinckley.
Project Reference.	P9013.
Client.	Mather Jamie.
Site Location (address).	Workhouse Lane, Burbage, Hinckley, Leicestershire.
National Grid Reference.	SP 442 918.
Site Area (Ha).	2.6.
Summary of Proposed Development.	It is understood that the Client proposes to develop the site with residential properties and associated infrastructure. The proposed end use includes private gardens and areas of soft landscaping.
Client Supplied Information.	· The location of the site. · WSP ground investigation report.
Site Setting.	The site is located approximately 3km south east of Hinckley town centre and approximately 500m south of Burbage village centre. The northern boundary is formed by residential housing and gardens, the western and southern boundaries by hedgerows with agricultural land beyond, and the eastern boundary by Workhouse Lane. The site is presently used as grazing land; the site boundaries comprised of wire fences and various vegetation including an approximately 25m tall, mature poplar tree, numerous mature ash, an approximately 15m tall sycamore with hedgerows of hawthorn and elder shrubs. An approximately 15m tall ash tree is situated in the centre of the site. The ground surface is undulating with a general fall towards the southern corner. Ridge and furrow was observed in the north eastern extent of the site suggesting historic agricultural activity. Marshy, waterlogged ground was noted in the south west. Manhole covers are located in the west, indicating buried services. Overhead cables are located in the east, running in a north-south orientation.
Site History.	<u>On site</u> The map for 1886 records the site to comprise open fields with internal field boundaries. No significant changes have occurred until the map for 1960-1963 where a spring is recorded in the south west. The internal field boundaries are no longer recorded

	after the map for 1981-1986. Aerial imagery for 1999 records a tree in the central western part of the site. The site remains unchanged until the aerial imagery for 2023. <u>Surrounding area</u> The area surrounding the site has included an orchard associated with White House Farm situated to the immediate south (1888-1960), buildings associated with White House Farm to the immediate south east (1888-present), a pond within the orchard to the immediate south (1888-1978, presumed infilled), Workhouse Lane to the immediate east (1888-present), fields to the immediate north (1888-2014), fields to the immediate west (1888-present), allotments approximately 10m east (1925-present), a stream flowing east approximately 40m south (1888-present\), a pond to the immediate north (1888-1960, presumed infilled), another pond to the immediate north (1925-2010, presumed infilled), an orchard approximately 10m east (1903-1981), and residential housing to the immediate north (2014-present).
Geology.	Superficial deposits of Wolston Sand and Gravel (sand and gravel) are recorded in the centre of the site, and Oadby Member (Diamicton) is recorded in the northern and southern corners. The relative ages of the Wolston Sand and Gravel and the Oadby Member are unclear, it seems likely that the Oadby member is younger. However, given that the site is flat the presence of older Wolston Sand and Gravel deposits in the centre of the site is anomalous, possibly indicating a previous channel infilled with unmapped more recent deposits, or the inherent variability of such deposits leading to uncertainty in identification. A solid geology of Mercia Mudstone Group comprising mudstone is recorded beneath the entirety of the site and is likely to have weathered to a silty clay at shallow depth. The findings of the WSP investigation will be included in Section 3, with the results of the GRM investigation.

	Past work in the area by GRM suggests that superficial deposits comprising sand and clay strata will be present to depths in excess of 8m, and also identified very variable superficial strata. The Solid strata of the Mercia Mudstone Group were not encountered during previous GRM investigations in the local area. The local strata are reported to lie sub-horizontally. There are no geological faults within 500m of the site.
Hydrogeology.	The Environment Agency has classified the underlying Wolston Sand and Gravel as a Secondary A Aquifer, and the Oadby Member as a Secondary (Undifferentiated) Aquifer. The Mercia Mudstone Group is classed as a Secondary B Aquifer. Given the cohesive nature of the Oadby Member and the Mercia Mudstone neither are considered to be viable receptors. There are four recorded groundwater abstraction licenses within 500m of the site, all of which were recorded for general farming and domestic use. There are no potable water abstraction licenses within 500m of the site. The site is not recorded to be within a Groundwater Source Protection Zone. A spring is located in the south west of the site. Information available at this stage suggests the groundwater table will most likely be within the Wolston Sand and Gravel.
Hydrology.	Local surface water features include: · A spring in the south west of the site which is recorded as the source of an on-site inland river, which is located along the south western boundary and flows to the south west. · A stream flowing east approximately 40m south of the site. There are no surface water abstraction licenses within 500m of the site. There have been no recorded pollution incidents within 500m of the site.
Flooding.	The BGS suggests that site is within an area of potential groundwater flooding related to superficial deposits flooding and that the confidence level is

	moderate. 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. The site is not within 250m of a fluvial floodplain; however, as the site is over 1ha in size, and a Flood Risk Assessment (FRA) will be required.
Mining and Quarrying.	<u>Coal mining</u> The site is not recorded to require a Coal Authority mining report and no shallow coal-bearing strata are indicated; therefore, the risk from coal mining is considered to be negligible. <u>Gypsum</u> The Mercia Mudstone Group is known for its gypsum bearing strata. The Mineral Resource Map for Leicestershire and Rutland (2002) does not record the site to be in an area where the 'main gypsum bearing formation' outcrops. Therefore, there is not considered to be a risk from gypsum extraction. <u>Quarrying</u> There is no evidence of any non-coal mineral extraction having taken place within, or close to the site area.
Environmental Information.	There are three unspecified tanks within 250m of the site; however, considering their distance, it is considered very unlikely that the tanks could provide contamination in volumes large enough to impact the site. There have been no recorded pollution incidents within 250m of the site. There are no recorded landfill sites (active and historical) within 250m of the site.
Potential Soil Contamination Sources.	There is considered to be a very low risk that the shallow site soils will be contaminated with pesticides. Pesticides associated with adjacent allotments and orchard gardens, are also considered to be a very low risk.
Potential Ground Gas Sources (including Radon).	No radon protection measures are required.

	Potential made ground associated with off-site infilled ponds, considered very low risk due size and intervening cohesive strata.

The Phase I Ground Hazard Diagram is presented in Appendix B.

2.1 PHASE I CONCEPTUAL SITE MODEL

HUMAN HEALTH			
Source	**Pathway**	**Receptor**	**Level of Risk**
Shallow on-site soils potentially contaminated with pesticides.	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.
Potentially contaminated ground associated with adjacent orchards and allotment gardens.		Construction and Maintenance Workers.	
Made ground / fill from infilled ground (<250m from site).	Inhalation of ground gas.	End users.	Very Low.

CONTROLLED WATERS			
Potentially contaminated ground associated with adjacent orchards and allotment gardens.	Leaching of contaminants and vertical migration to the groundwater.	Secondary A Aquifer.	Very Low.
	Leaching of contaminants and lateral migration to surface waters.	Spring and inland river on site.	Very Low.

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 by WSP in 2019, comprising five windowless sample boreholes (WS01-WS05) and four trial pits (TP01-TP04) the latter used for soakaway testing. The purpose of the investigation was primarily to determine the groundwater conditions at the site to support a viability assessment for soakaway drainage. Groundwater was identified across the site at between 0.5m and 4m below existing round level (begl).

As part of the Phase II Site Appraisal, GRM were requested to determine the extent of the water-bearing strata over a six-month period, utilising data-loggers, whilst collecting shallow soils for chemical analysis.

Fieldwork was undertaken by GRM between 28th and 29th June 2023 with groundwater monitoring visits continuing after that period. A total of ten windowless sample boreholes (WS01-WS10) ranging in depth between 2.80m and 4.00m begl were undertaken. The GRM exploratory hole location plan and exploratory hole logs are presented in Appendix C and Appendix D respectively. The results of the WSP investigation are also included in Appendix C and D.

Five gas and water monitoring standpipes were installed during the WSP site works and ten groundwater standpipes with data loggers were installed during the GRM site works, the rationale for these works are discussed fully in Section 6. A Monitoring Plan, illustrating the locations of the standpipes, is presented in Appendix E. The GRM standpipes will need to remain in place until the 15th December 2023.

3.1.1 PROVEN GROUND

The following ground conditions were encountered during the investigation fieldwork:

- Topsoil.
- Made ground.
- Alluvium.
- Oadby Member.
- Wolston Sand and Gravel.
- Mercia Mudstone Group (WSP investigation only).

It should be noted that previous work in the local area by GRM has shown the strata to be locally highly variable, with a variable thickness of Alluvium and large sand lenses present in the Oadby Member, making the geological sequence difficult to interpret.

3.1.2 Topsoil

Topsoil (including subsoil) was encountered in all exploratory holes to depths ranging between 0.20m and 1.55m begl with a general thickness of 0.40m. The topsoil comprised variably clayey, variably gravelly SAND with gravel of chalk and chert, and variably sandy, variably gravelly CLAY with gravel of chert.

3.1.3 Made Ground

No made ground was encountered during the GRM investigation.

During the WSP investigation, made ground was only encountered in TP02 as grey, slightly gravelly CLAY with gravel of chalk, chert and mudstone to depths between 0.20m and 0.40m begl.

The made ground encountered by WSP was composed of entirely natural constituents and therefore is considered more likely to be reworked natural strata; no other occurrences of made ground were encountered.

3.1.4 Alluvium

These deposits were generally encountered in the centre and east of the site in GRM holes WS05, WS06, WS07, WS08 and WS09 beneath the topsoil to depths of between 0.90m and 2.40m begl. Alluvium is not recorded to underlie the site on the geological mapping; however, the strata encountered are considered to be representative of Alluvium which is consistent with the WSP findings.

During the WSP investigation, these deposits were only found in WS01, WS03, WS05, TP03 and TP04 beneath the topsoil to depths of between 0.60m and 1.80m begl. The Alluvium was absent from the western site area.

These deposits generally comprised:

- Soft, to firm light brown, brown and grey, slightly gravelly, sandy CLAY with gravel of chert, quartzite and rare chalk.
- Medium dense, orangish-brown SAND.
- Firm, locally soft, light grey and orangish-brown, slightly sandy, slightly gravelly CLAY with gravel of chert.

Standard Penetration N-value results within these deposits are summarised in the table below:

Depth (begl)	Standard Penetration Test N-value range		Equivalent Strength or Density	
	Cohesive	Granular	Strength (cohesive)	Density (granular)
1.0m	6 to 8	4	Low to Medium	Loose
2.0m	15	17	Medium	Medium dense

Utilising the empirical relationship formulated by Stroud (1974) where undrained shear strength is related to SPT N-values and a factor based on plasticity, the indicative soil strengths are shown in the above table. The results indicted a general increase in soil strength with depth.

Standard Penetration Test N-values in the granular strata generally ranged between 4 and 17, This suggests that they are generally loose to medium dense.

Standard Penetration Tests and hand shear vane measurements were not undertaken by WSP; therefore no strength data is available.

3.1.5 Oadby Member

These strata were found across the entire site with the exception of WS05 and WS08 from depths between 0.40m and 2.40m begl and to depths of between 2.80m and 5.00m begl, the base of which was not proven.

These deposits generally comprised:

- Firm to very stiff, locally soft, grey and brown, slightly sandy, gravelly CLAY with gravel of chalk, chert and quartzite, and rare mudstone, coal and sandstone.
- Firm to stiff, dark brownish-grey, slightly sandy, silty CLAY.
- Loose to medium dense, brown, slightly clayey SAND.

Standard Penetration N-value results within these deposits are summarised in the table below:

Depth (begl)	Standard Penetration Test N-value range		Equivalent Strength or Density	
	Cohesive	Granular	Strength (cohesive)	Density (granular)
1.0m	4 to 15	6	Low to Medium	Loose
2.0m	11 to 17, locally 24	-	Medium to High	-
3.0m (2.80m)	15 to 28 (50)	-	High (Very High)	-
4.0m	50, locally 16	-	Very High, locally High	-
5.0m	20	-	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, the indicative soil strengths are shown in the above table. The results indicted a general increase in soil strength with depth.

Granular strata of the Oadby Member were only encountered in WS02; a Standard Penetration Test N-value of 6 was recorded in this granular stratum, which suggests that the material was loose.

Localised surface softening was encountered in the shallow soils in WS01, WS02 and WS03. This is anticipated to be due to the locally shallow groundwater.

The findings by GRM are generally consistent with those of WSP where these deposits were encountered across the entire site to depths of between 2m and 4.1m begl.

Standard Penetration Tests and hand shear vane measurements were not undertaken by WSP; therefore, no strength data is available.

3.1.6 Wolston Sand and Gravel

These strata were variable and only found in the central site area in WS05 and WS08, beneath the Alluvium, and are spatially consistent with the geological mapping. These strata were encountered between depths of 0.90m and 5.00m, the base of which was not proven.

During the WSP investigation, these deposits were encountered in the centre of the site only (WS02, WS04, WS05, TP04) and are spatially consistent with the geological mapping. These strata were encountered to depths of between 2.20m and 5.00m begl, the base of which was not proven in WS04, WS05, TP02 and TP04.

The previous investigation by WSP encountered Wolston Sand and Gravel in a larger number of exploratory holes than the current investigation undertaken by GRM, although both investigations are spatially consistent with the geological mapping, proving Wolston Sand and Gravel to underlie the centre of the site.

The exploratory holes indicate the presence of an unmapped alluvial channel cutting through the younger Oadby Member down to the Wolston Sand and Gravel. The boundary between the Alluvium and the Wolston Sand and Gravel is unclear due to their similar appearance and likely reworking of the Wolston Sand and Gravel.

These deposits generally comprised:

- Firm, greyish-brown, sandy SILT.
- Loose to medium dense, brown and grey, slightly clayey SAND.
- Medium dense to very dense, greyish-brown and brown, slightly gravelly SAND with gravel of chert and quartzite.

Standard Penetration N-value results within these deposits are summarised in the table below:

Depth (begl)	Standard Penetration Test N-value range		Equivalent Strength or Density	
	Cohesive	Granular	Strength (cohesive)	Density (granular)
1.0m	-	6	-	Loose
2.0m	13	14	Medium	Medium dense
3.0m	-	12 to 50	-	Medium dense to very dense
4.0m	-	16	-	Medium dense

Utilising the empirical relationship formulated by Stroud (1974) where undrained shear strength is related to SPT N-values and a factor based on plasticity, the indicative soil strengths are shown in the above table. The results indicted a general increase in soil strength with depth.

Standard Penetration Test N-values in the granular strata generally ranged between 6 and 16 and were locally as high as 50 This suggests that they are generally loose to medium dense, locally very dense.

Standard Penetration Tests were not undertaken by WSP; therefore, no density data is available.

3.1.7 Mercia Mudstone Group

Strata considered representative of the Mercia Mudstone Group were not encountered during the investigation undertaken by GRM.

The strata recorded by WSP were encountered in two locations (WS01 and WS02) from depths between 3.45m and 4.10m. The base of these strata was not proven.

These strata were encountered as firm to stiff, reddish-brown, slightly sandy, slightly gravelly CLAY with gravel of mudstone, chalk and chert.

The description of the strata is more representative of Oadby Member, therefore it is considered unlikely that Mercia Mudstone Group strata underlies the site at depths shallower than 5.00m begl.

Standard Penetration Tests and hand shear vane measurements were not undertaken by WSP; therefore, no strength data is available.

3.2 CONTAMINATION OBSERVATIONS

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

3.3 GROUNDWATER OBSERVATIONS

Groundwater observations by GRM are recorded in the table below:

Hole ID	Depth (mbegl)	Description of observation	Geological unit
WSP Investigation			
WS01	1.10	Groundwater encountered at 1.10m	Alluvium
WS02	1.30	Groundwater encountered at 1.30m	Wolston Sand and Gravel
WS03	1.30	Groundwater encountered at 1.30m	Alluvium
WS04	4.00	Groundwater encountered at 4.00	Wolston Sand and Gravel
WS05	0.50	Groundwater encountered at 0.50m	Alluvium
TP02	2.20	Groundwater encountered at 2.20m.	Wolston Sand Gravel
GRM Investigation			
WS02	0.90 to 1.50	Recovered damp between 0.90m and 1.50m	Oadby Member
WS05	0.90 to 2.50, from 2.50	Recovered damp between 0.90m and 2.50m, recovered wet from 2.50m	Wolston Sand and Gravel
WS06	1.80 to 2.20	Recovered damp between 1.80m and 2.20m	Alluvium
WS08	1.10 to 2.00, from 2.00	Recovered damp between 1.10m and 2.20m, recovered wet from 2.20m	Alluvium and Wolston Sand and Gravel

Groundwater strikes were recorded in predominantly granular strata of the Wolston Sand and Gravel and Alluvium, and locally within granular horizons of the Oadby Member as damp or wet strata. Groundwater was largely encountered in the centre and west of the site adjacent to the recorded spring, however, the exploratory techniques used were rapid and may have masked other small water seepages.

Long term monitoring of groundwater levels is currently being undertaken. Data loggers have been emplaced in all GRM exploratory holes to allow for long term groundwater monitoring over a six-month period, data will be recovered during monthly visits and the depth of the groundwater recorded during each visit.

To date one monitoring visit has been conducted (27th July 2023) and the results are included in Appendix E.

3.4 GROUND GAS AND VAPOURS

The Phase 1 Conceptual Ground Model identified made ground/in-filled ground located with 250m of the site boundary (off site), therefore assessed the risk from ground gas to the site as being very low. The previous and recent ground investigations have confirmed that no significant sources of ground gas are present on the site, therefore the risk remains very low.

As the risk is considered to be very low, and the cohesive strata present across a significant portion of the site is likely to substantially break the expose pathway between the source and the site, no ground gas monitoring is considered to be necessary.

3.5 SUMMARY OF FIELDWORK OBSERVATIONS

The fieldwork has revealed/confirmed the following:

Significant Features identified during fieldwork
Localised made ground (reworked natural) – potential deepened foundations. **Variable strata –** locally deepened or reinforced foundations. **Locally soft strata –** locally deepened or reinforced foundations. **Shallow groundwater** – excavation hazard, potential requirement for dewatering. **Cohesive strata in association with trees –** potential for heave, deepened foundations.

4 LABORATORY ANALYSES RATIONALE

4.1 CHEMICAL LABORATORY ANALYSIS

No chemical testing was undertaken by WSP.

Chemical laboratory analyses, undertaken by GRM, 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:

- Five samples of Topsoil were analysed for a general suite of contaminants (metals, inorganics and speciated PAH).
- Three samples of Topsoil have been screened for the presence of pesticides.

Whilst an isolated occurrence of made ground was identified by WSP, based on the description, lack of anthropogenic material and its presence beneath natural topsoil, the material is considered most likely to be reworked natural material. No occurrence of made ground was identified by GRM; accordingly, general soil leachate analysis has not been undertaken.

The chemical analysis results are presented in Appendix F.

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.

4.2 GEOTECHNICAL LABORATORY TESTING

No geotechnical testing was undertaken by WSP.

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

- Seven samples (three of Alluvium, three of Oadby Member, one of Wolston Sand and Gravel) underwent Atterberg Limits (PI) classification.
- Seven samples (two of Alluvium, three of Oadby Member, two of Wolston Sand and Gravel) underwent pH and water-soluble sulphate testing.

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 G and summarised in Section 10.2.

5 QUANTITATIVE RISK ASSESSMENT – HUMAN HEALTH (SOIL)

5.1 INTRODUCTION

The Client proposes to develop the site with residential properties with associated private gardens, soft landscaping and infrastructure.

Various sources of contamination have been put forward in 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 from potential pesticide contamination both on-site and from adjacent land.

Representative samples of all strata and those considered to be potentially contaminated by virtue of the desk study and/or based on site observations were collected for further examination and/or potential testing.

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 residential end use with plant uptake. In order to adopt a conservative approach a Soil Organic Matter (SOM) content of 2.5% has been used to assess the topsoil as this reflects the lowest SOM recorded in this material.

To provide an initial assessment, benzo(a)pyrene has been used as a surrogate marker compound for genotoxic PAHs with the exception of naphthalene. A copy of the thresholds used in this assessment is presented in Appendix H.

5.2 RISK TO END USERS

The chemical analysis results are presented in Appendix F.

Whilst the number of samples tested is considered sufficient to characterise the topsoil it is not considered appropriate to carry out statistical analysis on this data set; therefore, the results have been compared directly against the TAC. The results of the pesticides also been assessed separately.

5.2.1 Analysis of Soil Contamination Data

GRM General Suite – Topsoil

The chemical analysis did not reveal concentrations of contaminants in excess of the relevant TAC.

Pesticides – Topsoil

The screening for pesticides revealed the presence of such contamination in two samples of topsoil:

- WS05 @ 0.1-0.2m (<1mg/kg for EPN).
- WS09 @ 0.1-0.2m (<1mg/mg for EPN).

The concentrations of pesticides within the three samples analysed were all below the laboratory detection limit (<1mg/kg). EPN was tentatively identified in two samples; however, no UK screening level exists for this organophosphate insecticide. In order to assess the risk posed to end users the US EPA regional screening levels (May 2023) have been reviewed and there is no carcinogenic target risk threshold identified for EPN. A non-carcinogenic screening level of 0.63mg/kg is given for a child. Accordingly, although the risk posed to end users is considered to be very low, speciated pesticide analysis is recommended to confirm this assessment.

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. 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 very low and remedial works are considered unlikely to be required to protect them. If further remediation is found to be required, it is considered this should consist of source removal, or relocation to a less sensitive area e.g. not in residential gardens, and reuse in areas of public open space.

5.3 RISK TO SITE WORKERS

The investigation has not revealed any specific risk to site workers; however, the general comments outlined in Appendix A (vii) should be considered when site specific risk assessments are completed.

6 QUANTITATIVE RISK ASSESSMENT – HUMAN HEALTH (GROUND GAS)

Ground gas monitoring was beyond the scope of the GRM and WSP investigations. The ground investigations have not identified a viable source of ground gas, accordingly, the risk to end users is considered to be very low and gas protection measures are not considered to be required; however, this will require acceptance by the Local Authority.

The desk study risk assessment determined that no radon protection measures are required.

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 primary receptors for this site have been identified as underlying Secondary A aquifer (Wolston Sand and Gravel) and the on-site spring. The primary pathways are infiltration and surface run-off.

The pesticide concentrations recorded by the laboratory testing, specifically the EPN concentrations are considered to be very low. The extent of the Wolston Sand and Gravel strata (Secondary A aquifer) is limited, and it is also recorded to have cohesive strata of the Oadby Member and Alluvium overlying it. There are no recorded groundwater abstractions in the local area.

Therefore, a potential significant source of contamination has not been identified at the site and, with the limited pathway and low sensitivity of the receptor there is considered to be a very low risk to controlled waters and so soil leachate/water analysis has not been undertaken.

Further speciated pesticide analysis may be required to confirm this assessment.

7.1 INTERPRETATION OF GROUNDWATER OBSERVATIONS AND MONITORING

Long term groundwater monitoring is currently being conducted as part of the GRM investigation; one visit has been undertaken to date.

Evidence of damp or wet strata was encountered during the GRM investigation in the predominantly granular soils of the Alluvium and Wolston Sand and Gravel, and locally within granular horizons of the predominantly cohesive Oadby Member. Damp strata was encountered within four exploratory holes between depths of 0.90m and 2.50m begl, with wet strata encountered in two exploratory holes from depths of between 2.2m and 2.5m begl. WSP encountered groundwater during their investigation between depths of 0.5m and 4m begl within the Alluvium and Wolston Sand and Gravel, with no description with regards to ingress.

Two groundwater monitoring visits were undertaken by WSP (21st November 2019 and 13th December 2019) and groundwater was recorded between 0.25m and 0.92m begl, in all five installations suggesting shallow groundwater across the site, with the shallowest groundwater being encountered in the south and west, with a progressive deepening of the groundwater levels towards the north east. The groundwater data suggests a groundwater flow towards the south west.

Hole ID	Shallowest Groundwater occurrence (mbegl)	Geological unit
GRM Investigation: Monitoring 28/06/2023 to 27/07/2023		
WS01	2.25	Oadby Member
WS02	1.8	Oadby Member
WS03	0.5	Oadby Member
WS04	1.4	Oadby Member
WS05	0.9	Wolston Sand and Gravel
WS06	0.5	Alluvium
WS07	0.8	Alluvium
WS08	1.5	Alluvium
WS09	2.2	Oadby Member
WS10	1.2	Oadby Member

Initial logger data records groundwater at depths of between 0.5m and 2.25m across the site. In WS02, WS05, WS06 and WS08 the groundwater occurrences are consistent with the presence of granular strata (Wolston Sand and Gravel or Alluvium). It is likely that the groundwater encountered during both the WSP and GRM ground investigations, is representative of the regional groundwater table, with perched volumes over the cohesive strata of Alluvium and Oadby Member.

A further comment on the groundwater regime will be provided once the GRM monitoring period has been completed.

7.2 SUMMARY OF RISK TO CONTROLLED WATERS

The risk to the aquifer below the site is very low.

The risk to nearby surface waters is very low.

8 PHASE II CONCEPTUAL SITE MODEL

HUMAN HEALTH			
Source	**Pathway**	**Receptor**	**Remedial Solution**
Potential pesticide contamination of the topsoil.	Indoor and outdoor inhalation of soil/soil dust, 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.	If significant contamination is present then removal or relocation to less sensitive areas, of the existing topsoil.
		Construction workers.	
Made ground / fill from infilled ground (<250m from site).	Inhalation of carbon dioxide / methane.	End users.	No gas protection measures required (subject to LA agreement).
No source of contamination identified.	Migration of contamination through leaks and joints, degradation of water pipe materials.	End Users.	PE water supply pipes and clean backfill suitable (to be confirmed by water supply company).

CONTROLLED WATERS			
Potential pesticide contamination of the topsoil.	Leaching of contaminants and vertical migration to the groundwater.	Secondary A Aquifer (Wolston Sand and Gravel).	Remediation unlikely to be required.
	Infiltration and migration of surface water.	On site spring and associated stream.	

9 REMEDIATION

9.1 RECOMMENDED REMEDIAL MEASURES AND VALIDATION REQUIREMENTS

9.1.1 Protection of End Users

Soil Contamination

Currently, remediation due to soil contamination is not anticipated to be required. However, due to the pesticide concentrations recorded so far, limited remediation may be required to be required to protect end users of the proposed residential development. Additional laboratory testing is required to confirm the scope of any remediation.

Topsoil

The existing topsoil has been shown to contain low concentrations of the pesticide tentatively identified as (EPN - O-Ethyl O-(4-nitrophenyl) phenylphosphonothioate). The risk to end users from the reported concentrations of EPN (<1mg/kg) is considered to be very low; however, it is recommended that additional speciated analysis is undertaken to better determine the level of risk, and the spatial relationship of its occurrence.

At this stage, it would be prudent to make a budgetary allowance for the disposal, or relocation away from gardens to less sensitive areas (POS), of some of the topsoil due to pesticide contamination. The site is not anticipated to have a topsoil deficit, however if the additional testing finds it to be contaminated and therefore unsuitable, the site generated topsoil should be removed from site. Alternatively, if insufficient topsoil for the proposed development is present on site, the importation of a suitable growing medium may be required.

Any materials imported for use to as a suitable growing medium will require chemical validation to confirm that they are suitable for use. Samples of these materials will need to be analysed for a suite of contaminants including metals, inorganics, speciated PAHs and other contaminants such as, speciated hydrocarbons and asbestos depending on the source. The number of samples that require analysis will depend on the source of the materials. Typically, an analysis rate of one sample per two gardens and one sample per four gardens (minimum of three samples per source and material type) applies for generated and virgin soils respectively. It is also recommended that the topsoil be subjected to analysis to BS3882 to confirm that it conforms to this standard. A typical analysis rate of one sample per 1,000m^3 is considered appropriate for this site.

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 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

Gas protection measures are not considered to be necessary, for the proposed development, subject to Local Authority agreement.

9.1.2 Protection of Site Workers

The risk to site workers from the identified soil contamination is negligible. However, the use of suitable PPE and adoption of appropriate working protocols should be enforced during the ground works stage of construction.

9.1.3 Protection of Controlled Waters

The risk to controlled waters is very low and remedial measures are unlikely to be required. If the additional laboratory testing does identify elevated pesticide concentrations, soil leachate testing should also be undertaken.

9.1.4 Protection of Water Pipes

It is considered that, based on the UKWIR guidance, the concentrations of contaminants recorded to date (specifically the hydrocarbons) are such that PE water supply pipes should be suitable for the site. 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 Remedial Strategy is not currently required. This should be reviewed following the additional pesticide laboratory testing.

A Gas Protection Measures Design and Verification Plan is not required.

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

The topsoil will be classified as Non-Hazardous Waste.

The natural strata underlying the site is likely to be classified as Inert for disposal purposes; however, further testing will be required to confirm this. Natural soils may be suitable for re-use on-site as part of any capping layer and consideration should be given to retaining this material on-site. Alternatively, it may be sold as a commodity to off-set construction costs.

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

Although not identified during the site works, visible asbestos containing materials (ACMs) within soils will result in the soils being classified as Hazardous Waste. Visible ACMs should be removed, employing appropriate health and safety protocols and where possible should be undertaken prior to disposal.

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.

Where site-won materials (i.e. made ground or contaminated natural soils) are to be re-used on site, or materials are to be imported, it is recommended that this should be carried out under a Materials Management Plan produced in accordance with the CL:AIRE Definition of Waste Code of Practice. This document should be approved by a CL:AIRE-registered Qualified Person prior to excavation of materials, and be maintained throughout the duration of the project. A Verification Report should be produced on completion of the project in order to confirm the control and recording of material movements around or between sites in accordance with current waste management legislation and guidance.

10 GEOTECHNICAL ASSESSMENT

10.1 INTRODUCTION

The Client proposes to develop the site with residential properties with associated gardens, soft landscaping and infrastructure. Finished floor levels and the levels of any underground engineering works have not been provided.

Detailed development plans were not available at the time of report preparation so it has been assumed in the following assessment that the development will be in line with current planning guidance and comprise two to three storey residential housing.

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 out both on site by GRM and in the laboratory; the results of this testing are provided on the logs in Appendix D, and in Appendix G. These results are summarised in the tables below:

Alluvium

Insitu Testing:

Test Parameter	**Range of Results**		
SPT 'N' values	**Depth begl**	**Cohesive (strength)**	**Granular (density)**
	1.0m	6 to 8 (Low to Medium)	4 (Loose)
	2.0m	15 (Medium)	17 (Medium dense)

Laboratory Testing:

Test Parameter	**Range of Results**
Plasticity Index	15 to 21% (low to medium volume change potential)

Wolston Sand and Gravel

Insitu Testing:

Test Parameter	Range of Results		
SPT 'N' values	**Depth begl**	**Cohesive (strength)**	**Granular (density)**
	1.0m	-	6 (Loose)
	2.0m	13 (Medium)	14 (Medium dense)
	3.0m	-	12 to 50 (Medium dense to very dense)
	4.0m	-	16 (Medium dense)

Laboratory Testing:

Test Parameter	Range of Results
Plasticity Index	14% (low volume change potential)

Oadby Member

Insitu Testing:

Test Parameter	Range of Results		
SPT 'N' values	**Depth begl**	**Cohesive (strength)**	**Granular (density)**
	1.0m	4 to 15 (Medium)	6 (Loose)
	2.0m	11 to 17, locally 24 (Medium to High)	-
	3.0m (2.8m)	15 to 28 (50)	-
	4.0m	50, locally 16 (Very High, locally High)	-
	5.0m	20 (High)	-

Laboratory Testing:

Test Parameter	Range of Results
Plasticity Index	19 to 20% (low to medium volume change potential)

10.3 ENGINEERING GROUND TREATMENT

The near surface soils were generally firm under foot during the intrusive investigation with the exception of an area running parallel to the spring line in the west of the site which was noted as waterlogged and soft. This western area will require the localised use of a haul road, track matting or some other form of protection, to prevent the degradation of near surface soils.

It is considered unlikely that pre-treatment of the surface soils will be required for the remainder of the site (central and eastern areas) for any small plant/personnel movements.

A working platform will be required for any piling/vibro plant. 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 generally 500mm thick if constructed without reinforcement), should be made in tender packages and site programmes.

10.4 EXCAVATION CONDITIONS

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

No trial pit stability observations are available from the GRM investigation, however, based on the trial pits undertaken during the WSP investigation, it is likely that the excavations will be generally stable in the short-term. However, it should be noted that one trial pit collapsed during a soakaway test, suggesting some instability within the granular material, which is likely to be exacerbated in combination with water ingress. Further instability is likely to be experienced in the medium to long term.

At this stage, allowance for the use of full dewatering systems (e.g. well pointing) in the western area, and a portion of the central area where majority granular strata has been recorded, would be prudent until the results of the groundwater monitoring are available.

For the remainder of the site (70% of site area), the localised use of sump pumping should be sufficient to control minor groundwater ingress.

Care should be taken to ensure that dewatering does not lead to settlement of soils below existing structures or services on or off-site.

10.5 EXISTING STRUCTURES / SUBSTRUCTURES

There are no above structures on site; however buried services are known to be present. A pressurised foul sewer main is present running approximately east-west in the south of the site at approximately 2.20m begl, a manhole cover for the foul sewer main is in the west of the site. An overhead cable is present running approximately northwest-southeast in the east of the site, with a pole mounted transformer and buried electricity cable in the north east. These utilities are likely to require an easement or disconnection and relocation as part of development.

10.6 FOUNDATIONS

Soils at the site are variable. Cohesive Oadby Member is present beneath the topsoil in the west and a small area in the north east. Across the majority of the eastern area the Oadby Member is covered by deposits of Alluvium, which due to its inherent variability and general low strength is not considered to be suitable as a bearing stratum. Through the central area strata of the Wolston Sand and Gravel is present, which varied between silt and sand.

The topsoil and low strength natural clay with an undrained shear strength of less than 60kPa and loose granular strata 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 or granular strata. This will result in foundation depths of up to 2.5m begl.

The site is underlain by low to medium volume change clay. For design purposes it is recommended that medium volume change is adopted. Minimum foundation depths of between 0.6m (granular strata) and 0.9m (medium volume change potential cohesive strata) would normally be applicable for this site. However, as the occurrence of granular strata within the Alluvium and Oadby Member is unpredictable, it would be prudent to allow for a minimum founding depth of 0.9m throughout.

There are trees along and within the site boundaries and any new foundations within the zone of influence of these trees will need to be deepened in line with guidance in NHBC Standards Chapter 4.2. Based on the trees tentatively identified on site it is estimated that approximately 20% of the site will be affected by them. The resultant foundation depths can only be determined by a tree survey and tree influence drawing, but at this stage it is estimated that foundation depths of between 0.9m and 2.5m begl might be expected. It is possible, dependant upon layout and levels, that up to 10% of the site may require foundations deepening beyond 2.5m.

At this stage, and based on the above, it is considered likely that trench fill foundations, founded on the natural cohesive or granular strata will be suitable for 70% of the proposed development. Foundation depths of between 0.9m begl and 2.5m begl may be expected, with a typical foundation depth of 2.0m begl.

Trench fill Foundations

The natural cohesive and granular soils encountered, at anticipated foundation depths, were generally at least medium strength or medium dense respectively. It is anticipated that a nett allowable bearing pressure of at least 110kN/m^2 in the cohesive strata and the granular strata should be available for conventional strip or trench fill footings. This will allow line loads up to 49kN/m to be taken on footings 450mm wide and 66kN/m on footings 600mm wide. This should result in total settlements of not more than 20mm, keeping differential settlements within acceptable limits.

Heave precautions will be required where the foundations lie within the heave zone of trees as defined in 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.

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.

Given the presence of groundwater noted largely within the Wolston Sand and Gravel, but also within the Alluvium during the fieldworks, and situated in the central and eastern site areas it is recommended that an allowance is made for shoring, dewatering and the adoption of a dig and pour philosophy. The extent of these precautions will need to be further assessed on completion of the groundwater monitoring data.

Deepening to consistent strata is not recommended due to likely issues with water ingress and instability.

The strata at the site are variable and so an allowance should be made for the localised use of reinforcement as deepening to consistent strata runs the risk of encountering shallow groundwater.

If variable strata are encountered within the footing of a single plot the use of S2 concrete to mass fill the majority of the foundation and topped by a wet strip of RC-35 reinforced concrete containing two layers of B785 mesh is recommended.

Prior to development and with the benefit of a layout it is recommended that trial pitting is conducted together with hand shear vanes to determine whether the cohesive materials are suitable for foundations at shallower depth than indicated by the SPT values and to assess groundwater inflow rates particularly where granular strata are present. Delineation of the extents of the Wolston Sand and Gravel Member and or alluvial channel would also benefit foundation design.

Piles

Due to the presence of shallow, water-laden sand and deep soft or variable strata at this stage, it is recommended that allowance is made for 20% of the site to require piling.

Additionally, due to the influence of trees, it is possible that an additional 10% of the site could have foundations bearing at depths in excess of 2.5m begl (i.e within the engineer design zone); these areas are highlighted on the Foundation Zone Plan presented in Appendix K. Desiccation testing (to be undertaken in the summer months if trees are to remain or can be conducted at any time once removed) could be undertaken to determine a safe bearing depth for traditional foundations. However, until this is undertaken and given the variability of the soils, it would be prudent to allow for piling all plots within the engineer design zone.

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 boreholes to

provide information for detailed design. 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, i.e. engineer design is required. At this GRM would recommend budgeting for 10m long piles.

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.

10.7 FLOOR SLABS

Due to the localised influence of trees, it is recommended that an allowance be made for 20% of the site to have beam and block floors. The remainder of the site should be suitable either for cast in-situ suspended or beam and block floor slabs to suit commercial preferences.

10.8 BURIED CONCRETE

Based on the recorded water-soluble sulphate and pH levels in the soils below the site and assuming a worst case of mobile groundwater conditions, in accordance with 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-1.

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.

The results of the water-soluble sulphate and pH testing of are presented in Appendix G.

10.9 SLOPE STABILITY AND RETAINING STRUCTURES

The site is undulating with a slight fall to the south east corner, and the area surrounding is similar. Therefore, there is no significant risk of slope instability occurring on the site at present gradients.

Grading of the site, cut and fill operations, removal of trees/vegetation from existing slopes, interference with drainage around existing slopes or the cutting of the toe or surcharging of the crest of existing slopes may cause instability and failure to occur.

The present gradients on site are likely to be adjusted by minor earthworks. Future ground profiles may require earth retaining structures, for which further advice may be required when more information is available.

10.10 SEDIMENT MANAGEMENT

An inland river is recorded sourced at the on-site spring. The Environment Agency may require the spring to be protected from potential pollutants or prevent development in proximity to the spring.

Mitigation measures should be implemented to prevent the run-off 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

Four soakaway pits were constructed by WSP. Infiltration was too slow in two of the pits (TP01 and TP03) to allow a rate to be established, a groundwater strike (TP02) prevented the test being undertaken and the collapse of strata (TP04) rendered the location unsuitable.

Although the Wolston Sand and Gravel Member maybe suitable for soakaway drainage the presence of fines and shallow groundwater are likely to be mitigating factors in the suitability of this stratum. The Oadby Member is not considered suitable for soakaway drainage.

The project's drainage engineer should consider an alternative method of surface water disposal.

Consideration should be given to the need to line any future ponds to prevent groundwater ingress subject to location and depth.

The sites drainage design should take account of the natural spring in the south western area, associated stream, and shallow groundwater in the granular Wolston Sand and Gravel, and also potentially within the Alluvium. The presence of the off-site drainage ponds should also be taken into account.

10.12 NEW ACCESS ROADS

Site observations suggest that natural cohesive materials will have CBR values of between 2% and 4%, and the natural granular material a CBR of c. 5% when suitably drained. Proof rolling and the improvement 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. Lower CBR values should be anticipated in the areas of soft ground noted in the west and during periods of inclement weather.

Site observations should be confirmed by in situ or laboratory testing in accordance with the adopting Local Authority's preference.

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 groundwater monitoring program.
- Trial pitting and hand shear vanes to determine whether foundations can be shallowed and to determine groundwater inflow in areas of granular strata, and also to delineate the occurrence of the Wolston Sand and Gravel strata and or alluvial channel.
- Boreholes for detailed pile design.
- Tree survey.
- Additional pesticide analysis, and soil leachate analysis if found to be elevated.
- Consideration of shallow groundwater, spring and off-site ponds in drainage design.
- Should the development proceed it is recommended that further testing is conducted for waste disposal characterisation.
- 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. A copy should also be sent to the NHBC for their records.

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 geotechnical hazards and very low risk for contamination hazards. These are summarised in the Post Ground Investigation Hazard Plan (Ground Model) in Appendix I.

APPENDIX A

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
- BGS online viewer: http://www.bgs.ac.uk/data/mapViewers/home.html
- Environment Agency 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)'
- HPA-RPD-033 (2007), 'Indicative Atlas of Radon in England and Wales'
- PHE-CRCE-032 (PHE, 2017), Radon in Homes in England: 2016 Data Report
- CIRIA C665 'Assessing risks posed by hazardous ground gases to buildings'
- BS8485:2015, '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
- Cadmium
- Chromium
- Lead
- Mercury
- Selenium
- Copper
- Nickel
- Zinc
- Phenols
- cyanide (total)
- pH
- Water soluble sulphate
- PAH (polycyclic aromatic hydrocarbons)

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.

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.

APPENDIX B



NOTES:	CLIENT: Mather Jamie	PROJECT No: P9013	DATE: July 2019	DESIGN/DRAWN: RDH
	PROJECT: Land off Workhouse Lane, Burbage	DRAWING NUMBER: 01	ISSUE: Final	
	TITLE: Ground Hazard Plan	© GRM Development Solutions Ltd © Crown Copyright. AL 100014100		

GRM Development Solutions Ltd
Tel: 01283 551 249
mail@grm-uk.com www.grm-uk.com

APPENDIX C



NOTES:	CLIENT: MATHER JAMIE	PROJECT P9013	DATE 07/2023	DESIGN/ DRAWN AM
	PROJECT: LAND OFF WORKHOUSE LANE, BURBAGE, HINCKLEY	DRAWING 004	ISSUE: DRAFT	
	TITLE: GROUNDWATER MONITORING PLAN	© GRM Development Solutions Ltd © Crown Copyright. AL 100014100		

GRM Development Solutions Ltd
Tel: 01283 551 249
mail@grm-uk.com www.grm-uk.com

APPENDIX D

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 WS01
Sheet 1 of 1

Site Name: Land off Workhouse Lane, Burbage, Hinckley

Ground Level (mAOD)

Client: Mather Jamie

GRM Project Ref: P9013

Coordinates E N

Installation/ Backfill	Water Strike	Samples/Tests: Depth	Type	SPT Result	Depth (m)	Level (m)	Legend	Stratum Description
		0.10 - 0.20	ES					Brown, clayey SAND. Sand is fine to coarse. Abundant rootlets. TOPSOIL
					0.40			Soft, low strength, becoming firm, medium strength, dark grey mottled brown, slightly sandy, gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded chalk, chert and quartzite. Rootlets observed to 2.00m. OADBY MEMBER
		0.80 - 0.90	D					
		1.00	C	N=4 (1,1/1,1,1,1)				
		1.50 - 1.60	D					
								Not mottled brown from 1.60m.
		2.00	C	N=12 (3,3/3,3,3,3)				
		2.50 - 2.60	D					
		3.00	C	N=15 (3,3/3,4,4,4)				
					3.50			Firm to stiff, high strength, dark brownish-grey, slightly sandy, silty CLAY. Sand is fine to coarse. OADBY MEMBER
		3.60 - 3.70	D					
		4.00	C	N=16 (4,4/4,4,4,4)				
		4.60 - 4.70	D					
		5.00	C	~~N=20 (4,5/5,5,5,5)~~	5.00			End of Borehole at 5.000m

Crew: Dynamic Sampling UK Ltd. **Logger:** AM **Weather:** Overcast.

Equipment: Tracked Window Sampling Rig

Reason for termination of borehole: Target depth reached.

Groundwater Remarks:
No groundwater encountered.

General Remarks:

Hole Started: 28/06/2023 **Hole Complete:** 28/06/2023 **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 WS02
Sheet 1 of 1

Site Name: Land off Workhouse Lane, Burbage, Hinckley

Ground Level (mAOD)

Client: Mather Jamie

GRM Project Ref: P9013

Coordinates E N

Installation/ Backfill	Water Strike	Samples/Tests Depth	Type	SPT Result	Depth (m)	Level (m)	Legend	Stratum Description
		0.10 - 0.20	ES					Light brown, slightly clayey SAND. Sand is fine to coarse. Abundant rootlets. TOPSOIL
					0.40			Soft to firm, approximately low to medium strength, dark grey and dark brown, slightly sandy, gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded chalk, chert and quartzite. OADBY MEMBER
		0.70 - 0.80	D					
		1.00	C	N=6 (2,2/2,2,1,1)	0.90			Loose to medium dense, brown, slightly clayey SAND. Sand is fine to coarse. Recovered damp. OADBY MEMBER
		1.10 - 1.20	D					
					1.50			Firm, medium strength, becoming stiff to very stiff, high to very high strength, dark grey and dark brown, slightly sandy, gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded chalk, chert and quartzite. Rootlets observed to 2.00m. OADBY MEMBER
		1.80 - 1.90	D					
		2.00	C	N=12 (3,3/3,3,3,3)				
		2.80 - 2.90	D					
		3.00	C	N=16 (4,4/4,4,4,4)				
		3.80 - 3.90	D					
		4.00	C	50 (8,9/50 for 295mm)	4.00			End of Borehole at 4.000m

1 2 3 4 5

Crew: Dynamic Sampling UK Ltd | **Logger:** AM | **Weather:** Overcast.

Equipment: Tracked Window Sampling Rig

Reason for termination of borehole: SPT refusal at 4.00m.

Groundwater Remarks:
Recovered damp between 0.90m and 1.50m.

General Remarks:

Hole Started: 28/06/2023 | **Hole Complete:** 28/06/2023 | **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: Land off Workhouse Lane, Burbage, Hinckley

Ground Level (mAOD)

Client: Mather Jamie

GRM Project Ref: P9013

Coordinates E N

Installation/ Backfill	Water Strike	Samples/Tests: Depth	Type	SPT Result	Depth (m)	Level (m)	Legend	Stratum Description
		0.10 - 0.20	ES					Dark brown, very sandy CLAY. Sand is fine to coarse. Abundant rootlets. TOPSOIL
					0.40			Soft to firm, low to medium strength, becoming very stiff, very high strength, dark grey and orangish-brown, slightly sandy, gravelly CLAY. Sand is fine to coarse, subangular to subrounded chalk, chert and quartzite. Rootlets observed to 2.00m. OADBY MEMBER
		0.90 - 1.00	D					
		1.00	C	N=8 (1,1/2,2,2,2)				
		1.50 - 1.60	D					
		2.00	C	N=12 (3,3/3,3,3,3)				
		2.50 - 2.60	D					
		3.00	C	N=15 (3,3/3,4,4,4)				*Becoming stiff from 3.00m.*
		3.50 - 3.60	D					
		4.00	C	N=50 (7,7/50 for 260mm)	4.00			End of Borehole at 4.000m

1 2 3 4 5

Crew: Dynamic Sampling UK Ltd | **Logger:** AM | **Weather:** Overcast.

Equipment: Tracked Window Sampling Rig

Reason for termination of borehole: SPT refusal at 4.00m.

Groundwater Remarks:
No groundwater encountered.

General Remarks:

Hole Started:	28/06/2023	**Hole Complete:**	28/06/2023	**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: Land off Workhouse Lane, Burbage, Hinckley

Ground Level (mAOD)

Client: Mather Jamie

GRM Project Ref: P9013

Coordinates E N

Installation/ Backfill	Water Strike	Samples/Tests: Depth	Type	SPT Result	Depth (m)	Level (m)	Legend	Stratum Description
		0.10 - 0.20	ES					Dark brown, clayey SAND. Sand is fine to coarse. Abundant rootlets. TOPSOIL
					0.40			Firm, medium strength, becoming very stiff, very high strength, grey and brown, slightly sandy, gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded chalk, chert and quartzite. OADBY MEMBER
		0.80 - 0.90	D					
		1.00	C	N=8 (2,2/2,2,2,2)				
		1.50 - 1.60	D					
		2.00	C	N=11 (2,2/2,3,3,3)				*Not mottled brown from 2.00m.*
		2.50 - 2.60	D					
		3.00	C	N=15 (3,3/3,4,4,4)				
		3.50 - 3.60	D					
		4.00	C	50 (9,10/50 for 275mm)	4.00			End of Borehole at 4.000m

1 2 3 4 5

Crew: Dynamic Sampling UK Ltd | **Logger:** AM | **Weather:** Overcast.

Equipment: Tracked Window Sampling Rig

Reason for termination of borehole: SPT refusal at 4.00m.

Groundwater Remarks:
No groundwater encountered.

General Remarks:

Hole Started: 28/06/2023 | **Hole Complete:** 28/06/2023 | **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: Land off Workhouse Lane, Burbage, Hinckley

Ground Level (mAOD)

Client: Mather Jamie

GRM Project Ref: P9013

Coordinates E N

Installation/ Backfill	Water Strike	Samples/Tests Depth	Type	SPT Result	Depth (m)	Level (m)	Legend	Stratum Description
		0.10 - 0.20	ES					Dark brown, clayey SAND. Sand is fine to coarse. Abundant rootlets. TOPSOIL
					0.40			Soft, approximately low strength, light brown and grey, slightly gravelly, sandy CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded chert, quartzite and rare chalk. ALLUVIUM
		0.80 - 0.90	D		0.90			
		1.00	C	N=6 (2,2/2,2,1,1)				Loose, brown and grey, slightly clayey SAND. Sand is fine to coarse. Recovered damp. WOLSTON SAND AND GRAVEL
		1.20 - 1.30	D					
					1.50			Firm, medium strength, greyish-brown, sandy SILT. Sand is fine to coarse. Rootlets and organic material observed to 2.40m. Recovered damp. WOLSTON SAND AND GRAVEL
		1.80 - 1.90	D					
		2.00	C	N=13 (3,3/3,3,3,4)				
					2.40			Loose, brown and grey, slightly clayey SAND. Sand is fine to coarse. Recovered wet from 2.50m. WOLSTON SAND AND GRAVEL
		2.50 - 2.60	D					
					2.70			Firm, medium strength, greyish-brown, sandy SILT. Sand is fine to coarse. Recovered wet. WOLSTON SAND AND GRAVEL
		2.80 - 2.90	D					
		3.00	C	N=12 (2,2/2,2,4,4)	3.00			Loose to medium dense, brown and grey, slightly clayey SAND. Sand is fine to coarse. Recovered wet. WOLSTON SAND AND GRAVEL
		3.50 - 3.60	D					
		4.00	C	N=16 (2,2/4,4,4,4)	4.00			End of Borehole at 4.000m

Crew: Dynamic Sampling UK Ltd | **Logger:** AM | **Weather:** Overcast.

Equipment: Tracked Window Sampling Rig

Reason for termination of borehole: Hole collapsed up to 3.00m.

Groundwater Remarks:
Recovered damp between 0.90m and 2.50m. Recovered wet from 2.50m.

General Remarks:

Hole Started: 28/06/2023 | **Hole Complete:** 28/06/2023 | **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: Land off Workhouse Lane, Burbage, Hinckley

Ground Level (mAOD)

Client: Mather Jamie

GRM Project Ref: P9013

Coordinates E N

Installation/ Backfill	Water Strike	Samples/Tests: Depth	Type	SPT Result	Depth (m)	Level (m)	Legend	Stratum Description
		0.10 - 0.20	ES					Dark brown, very sandy CLAY. Sand is fine to coarse. Abundant rootlets. TOPSOIL
					0.40			
		0.60 - 0.70	D					Firm, approximately medium strength, dark brown, slightly sandy, silty, gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded chert and quartzite. ALLUVIUM
		1.00	C	N=8 (2,2/2,1,2,3)	1.00			Firm, medium strength, brown, slightly sandy, silty CLAY. Sand is fine to coarse. ALLUVIUM
		1.50 - 1.60	D					
					1.80			
		1.90 - 2.00	D					Medium dense, orangish-brown SAND. Sand is fine to coarse. Recovered damp. ALLUVIUM
		2.00	C	N=17 (3,3/4,5,4,4)				
					2.20			
		2.50 - 2.60	D					Stiff to very stiff, high to very high strength, dark grey, slightly sandy, gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded chalk, chert and quartzite. OADBY MEMBER
		3.00	C	N=28 (4,5/6,7,7,8)				
		3.50 - 3.60	D					
		4.00	C	N=50 (11,13/50 for 295mm)	4.00			End of Borehole at 4.000m

Crew: Dynamic Sampling UK Ltd | **Logger:** AM | **Weather:** Overcast.

Equipment: Tracked Window Sampling Rig

Reason for termination of borehole: SPT refusal at 4.00m.

Groundwater Remarks:
Recovered damp between 1.80m and 2.20m.

General Remarks:

Hole Started: 29/06/2023 | **Hole Complete:** 29/06/2023 | **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 WS07
Sheet 1 of 1

Site Name: Land off Workhouse Lane, Burbage, Hinckley

Ground Level (mAOD)

Client: Mather Jamie

GRM Project Ref: P9013

Coordinates E N

Installation/ Backfill	Water Strike	Samples/Tests: Depth	Type	SPT Result	Depth (m)	Level (m)	Legend	Stratum Description
		0.10 - 0.20	ES					Light brown, slightly clayey SAND. Sand is fine to coarse. Abundant rootlets. TOPSOIL
					0.50			
		0.90 - 1.00	D					Firm, medium strength, dark brown and orangish-brown, sandy CLAY. Sand is fine to coarse. ALLUVIUM
		1.00	C	N=8 (1,1/2,2,2,2)				
					1.30			
		1.50 - 1.60	D					Firm, locally soft, medium strength, light grey and orangish-brown, slightly sandy, slightly gravelly, silty CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular chert. ALLUVIUM
		2.00	C	N=15 (3,3/4,4,3,4)				
					2.40			
		2.50 - 2.60	D					Stiff, high strength, dark grey and dark brown, slightly sandy, slightly gravelly CLAY. Sand is fine to medium. Gravel is fine to medium, subangular to subrounded chert, mudstone, coal and quartzite. Rootlets observed to 3m. OADBY MEMBER
		3.00	C	N=25 (4,4/5,6,7,7)				
					3.50			
		3.60 - 3.70	D					Stiff to very stiff, high to very high strength, dark grey, slightly sandy, gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded chalk, chert and quartzite. OADBY MEMBER
		4.00	C	50 (10,17/50 for 295mm)	4.00			End of Borehole at 4.000m

Crew: Dynamic Sampling UK Ltd. **Logger:** AM **Weather:** Overcas

Equipment: Tracked Window Sampling Rig

Reason for termination of borehole: SPT refusal at 4.00m.

Groundwater Remarks:
No groundwater encountered.

General Remarks:

Hole Started: 29/06/2023 **Hole Complete:** 29/06/2023 **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 WS08
Sheet 1 of 1

Site Name: Land off Workhouse Lane, Burbage, Hinckley

Ground Level (mAOD)

Client: Mather Jamie

GRM Project Ref: P9013

Coordinates E N

Installation/ Backfill	Water Strike	Samples/Tests: Depth	Type	SPT Result	Depth (m)	Level (m)	Legend	Stratum Description
		0.10 - 0.20	ES					Light brown, clayey SAND. Sand is fine to coarse. Abundant rootlets. TOPSOIL
					0.40			Soft to firm, low strength, dark grey and orangish-brown, slightly gravelly, sandy CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded chert and quartzite. ALLUVIUM
		0.80 - 0.90	D					
		1.00	C	N=6 (1,1/1,2,1,2)				
					1.10			Soft to firm, low strength, light grey and orangish-brown, slightly gravelly, sandy CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded quartzite and chert. Recovered damp. ALLUVIUM
		1.50 - 1.60	D					
	▼	2.00	C	N=14 (3,2/3,3,4,4)	2.00			Medium dense becoming dense to very dense, brown, slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to medium, subangular to subrounded chert and quartzite. Recovered wet. WOLSTON SAND AND GRAVEL
		2.50 - 2.60	D					
		3.00	C	N=50 (10,11/50 for 285mm)	3.00			End of Borehole at 3.000m

1 2 3 4 5

Crew: Dynamic Sampling UK Ltd | **Logger:** AM | **Weather:** Overcast

Equipment: Tracked Window Sampling Rig

Reason for termination of borehole: SPT refusal at 3.00m.

Groundwater Remarks:
Recovered damp between 1.10m and 2.00m. Recovered wet from 2.00m.

General Remarks:

Hole Started: 29/06/2023 | **Hole Complete:** 29/06/2023 | **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 WS09
Sheet 1 of 1

Site Name: Land off Workhouse Lane, Burbage, Hinckley

Ground Level (mAOD)

Client: Mather Jamie

GRM Project Ref: P9013

Coordinates E N

Installation/ Backfill	Water Strike	Samples/Tests Depth	Type	SPT Result	Depth (m)	Level (m)	Legend	Stratum Description
		0.10 - 0.20	ES					Light brown, clayey SAND. Sand is fine to coarse. Abundant rootlets. TOPSOIL
		0.50 - 0.60	D		0.40			Loose, light brown, clayey SAND. Sand is fine to coarse. Occasional rootlets. ALLUVIUM
		0.90 - 1.00	D		0.70			Loose, dark brown, dark brown, slightly gravelly, very clayey SAND. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded quartzite. ALLUVIUM
		1.00	C	N=4 (1,1/1,1,1,1)				
		1.50 - 1.60	D		1.20			Soft, low strength, dark orangish-brown sandy CLAY. Sand is fine to coarse. ALLUVIUM
		2.00	C	N=20 (3,4/4,5,5,6)	2.00			Stiff to very stiff, high to very high strength, dark brownish-grey, slightly sandy, gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded chalk and chert. OADBY MEMBER
		2.50 - 2.60	D					
		2.80	C	50 (10,12/50 for 275mm)	2.80			End of Borehole at 2.800m

1 2 3 4 5

Crew: Dynamic Sampling UK Ltd | **Logger:** AM | **Weather:** Overcast.

Equipment: Tracked Window Sampling Rig

Reason for termination of borehole: Sampler and SPT refusal at 2.80m.

Groundwater Remarks:
No groundwater encountered.

General Remarks:

Hole Started: 29/06/2023 | **Hole Complete:** 29/06/2023 | **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 WS10
Sheet 1 of 1

Site Name: Land off Workhouse Lane, Burbage, Hinckley

Ground Level (mAOD)

Client: Mather Jamie

GRM Project Ref: P9013

Coordinates E N

Installation/ Backfill	Water Strike	Samples/Tests: Depth	Type	SPT Result	Depth (m)	Level (m)	Legend	Stratum Description
		0.10 - 0.20	ES					Dark brown, slightly clayey SAND. Sand is fine to coarse. Abundant rootlets. TOPSOIL
					0.40			Firm, medium strength, dark brown, slightly sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to medium, subangular to subrounded chert, chalk and quartzite. OADBY MEMBER
		0.80 - 0.90	D					
		1.00	C	N=15 (2,2/3,4,4,4)				
					1.20			Stiff to very stiff, high to very high strength, dark brown mottled grey, slightly sandy, gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded mudstone, chert, quartzite, coal and sandstone. OADBY MEMBER
		1.50 - 1.60	D					
		2.00	C	N=24 (4,4/5,6,6,7)				*Becoming slightly gravelly from 2.00m.*
		2.50 - 2.60	D					
		3.00	C	N=50 (9,11/50 for 231mm)	3.00			End of Borehole at 3.000m

Crew: Dynamic Sampling UK Ltd | **Logger:** AM | **Weather:** Overcast.

Equipment: Tracked Window Sampling Rig

Reason for termination of borehole: SPT refusal at 3.00m.

Groundwater Remarks:
No groundwater encountered.

General Remarks:

Hole Started:	Hole Complete:	Version:	Scale:
29/06/2023	29/06/2023	FINAL	1:31

WSP Level 2, 100 Wharfside Stree, Birmingham B1 1RT Telephone:	**BOREHOLE LOG**	Hole No. **WS01**
	Project Workhouse Lane	Sheet 1 of 2
Job No 70060615	Client	Date 11-11-19 11-11-19

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (NGR)	Ground Level (m AOD)
Dynamic Sampling Ltd	Premier Rig	B Fagan	E 444159.952 N 291761.996	110.285

SAMPLES & TESTS							STRATA						Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thick-ness)	Description		Legend	Geology	Dia. 50 mm
						1 ▽	109.99	0.30	Grass over dark brown clayey slightly gravelly fine to coarse SAND with frequent rootlets. Gravel is medium and coarse angular to rounded of chert. (TOPSOIL)			TS	
							109.79	0.50				ALV	
						1 ▼	109.29	(0.50) 1.00	Dark brown mottled orangish brown slightly gravelly very clayey fine to coarse SAND. Gravel is medium and coarse angular to rounded of chert. (ALLUVIUM)			ALV	
							108.99	1.30	Soft locally firm brown mottled dark bluish grey slightly gravelly slightly sandy CLAY. Gravel is fine to coarse angular to rounded of chert and rare chalk. (ALLUVIUM)			ALV	
							108.79	1.50	Yellowish brown very gravelly fine to coarse SAND. Gravel is fine and medium angular to rounded of chert. (ALLUVIUM)			ODT	
									Soft dark orangish brown mottled bluish grey slightly gravelly very sandy CLAY. Gravel is fine to coarse angular to rounded of chalk and chert. (OADBY MEMBER)				
								(2.60)	Soft mottled bluish grey slightly gravelly slightly sandy CLAY. Gravel is fine to coarse angular to rounded of chalkand chert. (OADBY MEMBER) 2.50 Becoming firm locally stiff with additional fine and medium angular mudstone gravel			ODT	
							106.19	4.10					
								(0.90)	Firm locally stiff reddish brown slightly sandy slightly gravelly CLAY. Gravel is fine and medium angular of mudstone, chalkand chert. (WEATHERED MERCIA MUDSTONE GROUP)			MMG	
							105.29	5.00					

Boring Progress						Water Strikes					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt	Date	Time	Strike	Minutes	Standing	Casing
						11-11-19		1.10	20	0.60	

Chiselling				Water Added	
From	To	Hours	Tool	From	To

General Remarks

Hole completed at 5.00m bgl. Groundwater encountered at 1.10m bgl, hand pit terminated at 1.30m bgl due to blind digging. No visual or olfactory evidence of contamination recorded.

Scale 1:62.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

WSP Level 2, 100 Wharfside Stree, Birmingham B1 1RT Telephone:	**BOREHOLE LOG**	Hole No. **WS02**
	Project Workhouse Lane	Sheet 1 of 2
Job No 70060615	Client	Date 11-11-19 11-11-19

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (NGR)	Ground Level (m AOD)
Dynamic Sampling Ltd	Premier Rig	B Fagan	E 444152.409 N 291825.786	112.258

SAMPLES & TESTS							STRATA					Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thick-ness)	Description	Legend	Geology	Dia. 50 mm
							111.71	(0.55) 0.55	Grass over dark brown clayey slightly gravelly fine to coarse SAND with frequent rootlets. Gravel is medium rounded of chert. (TOPSOIL)		TS	
						1			Pale yellowish brown gravelly fine to coarse SAND. Gravel is fine and medium angular to rounded of chalk and chert. (WOLSTON SAND AND GRAVEL)			
								(2.90)			WOSG	
									2.30 - 2.35 Band of medium black angular gravel of coal			
							108.81	3.45				
									Stiff locally firm brownish grey slightly gravelly slightly sandy CLAY. Gravel is fine and medium angular to well rounded of limestone, mudstone and chert. (WEATHERED MERCIA MUDSTONE GROUP)			
								(1.55)			MMG	
							107.26	5.00				

Boring Progress						Water Strikes					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt	Date	Time	Strike	Minutes	Standing	Casing
						11-11-19		1.30			

Chiselling				Water Added	
From	To	Hours	Tool	From	To

General Remarks

Hole completed at 5.0m bgl. Groundwater encountered at 1.30m bgl. Hand pit collapse below water strike. No visual or olfactory evidence of contamination recorded.

Scale 1:62.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

17 WSP BH LOG WORKHOUSE LANE.GPJ WSPETEMPLATE7.00.GDT 20/12/19

WSP Level 2, 100 Wharfside Stree, Birmingham B1 1RT Telephone:	**BOREHOLE LOG**	Hole No. **WS03**
	Project Workhouse Lane	Sheet 1 of 2
Job No 70060615	Client	Date 11-11-19 11-11-19

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (NGR)	Ground Level (m AOD)
Dynamic Sampling Ltd	Premier Rig	B Fagan	E 444212.263 N 291774.272	111.551

SAMPLES & TESTS							STRATA					Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thick-ness)	Description	Legend	Geology	Dia. 50 mm
							111.25	0.30	Grass over very soft brown very sandy slightly gravelly CLAY with frequent rootlets. Gravel is fine and medium angular to rounded of Chert. (TOPSOIL)		TS	
						▼1		(1.40)	Soft brown mottled pale grey slightly gravelly sandy CLAY. Gravel is fine to coarse angular to rounded of chalk and chert. (ALLUVIUM)		ALV	
							109.85	1.70				
							109.55	2.00	Firm dark brown slightly sandy slightly gravelly CLAY. Gravel is fine and medium angular to subrounded of chert. (OADBY MEMBER)		ODT	
								(1.70)	Firm locally stiff grey gravelly CLAY. Gravel is fine to coarse angular to rounded of chalk, mudstone and chert. (OADBY MEMBER)		ODT	
3.70	SPT	25,0,17 11,12,10 N=50/ 275mm (C)					107.85	3.70				

Boring Progress						Water Strikes					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt	Date	Time	Strike	Minutes	Standing	Casing
						11-11-19		1.30			

Chiselling				Water Added	
From	To	Hours	Tool	From	To

General Remarks

Hole terminated at 3.70m bgl on refusal. Groundwater encountered at 1.30m bgl, hand pit collapse below. No visual or olfactory evidence of contamination recorded.

Scale 1:62.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

17 WSP BH LOG WORKHOUSE LANE.GPJ WSPETEMPLATE7.00.GDT 20/12/19

WSP Level 2, 100 Wharfside Stree, Birmingham B1 1RT Telephone:	**BOREHOLE LOG**	Hole No. **WS04**
	Project Workhouse Lane	Sheet 1 of 2
Job No 70060615	Client	Date 11-11-19 11-11-19

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (NGR)	Ground Level (m AOD)
Dynamic Sampling Ltd	Premier Rig	B Fagan	E 444228.033 N 291883.049	115.199

SAMPLES & TESTS							STRATA					Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thick-ness)	Description	Legend	Geology	Dia. 50 mm
							114.80	0.40	Grass over dark brown slightly clayey fine to coarse SAND with frequent rootlets. (TOPSOIL)		TS	
							112.60	(2.20) 2.60	Soft locally firm grey mottled yellowish brown slightly gravelly sandy CLAY. Gravel is fine and medium angular to rounded of chalk and chert. (OADBY MEMBER) 2.15 - 2.30 Very soft grey horizon with elongate wood fragments, localised pocket not throughout core		ODT	
							112.00	(0.60) 3.20	Dark yellowish brown very gravelly medium and coarse SAND. Gravel is fine to coarse angular to well rounded of chalk, mudstone and chert. (WOLSTON SAND AND GRAVEL)		WOSG	
						▼1	111.20	(0.80) 4.00	Stiff brown gravelly slightly sandy CLAY. Gravel is fine and medium angular to well rounded of chalk, mudstone and chert. (WOLSTON SAND AND GRAVEL)		WOSG	
							110.20	(1.00) 5.00	Yellowish brown slightly clayey fine to coarse SAND and fine to coarse very angular to well rounded GRAVEL of chalk, mudstone and chert. (WOLSTON SAND AND GRAVEL)		WOSG	

Boring Progress						Water Strikes					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt	Date	Time	Strike	Minutes	Standing	Casing
						11-11-19		4.00			

Chiselling				Water Added	
From	To	Hours	Tool	From	To

General Remarks
Hole completed at 5.0m bgl. Groundwater encountered at 4.0mbgl. No visual or olfactory evidence of contamination recorded.

Scale 1:62.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

17 WSP BH LOG WORKHOUSE LANE.GPJ WSPETEMPLATE7.00.GDT 20/12/19

WSP Level 2, 100 Wharfside Stree, Birmingham B1 1RT Telephone:	**BOREHOLE LOG**	Hole No. **WS05**
	Project Workhouse Lane	Sheet 1 of 2
Job No 70060615	Client	Date 11-11-19 11-11-19

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (NGR)	Ground Level (m AOD)
Dynamic Sampling Ltd	Premier Rig	B Fagan	E 444300.461 N 291868.605	115.287

SAMPLES & TESTS							STRATA						Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thick-ness)	Description		Legend	Geology	Dia. 50 mm
						1	114.79	(0.50) 0.50	Grass over brown slightly clayey fine and medium SAND with frequent rootlets. (TOPSOIL)			TS	
							113.49	(1.30) 1.80	Soft orangish brown slightly gravelly sandy CLAY. Gravel is fine to coarse angular to rounded of chalk, chert and mudstone. (ALLUVIUM)			ALV	
							110.44	(3.05) 4.85	Yellowish brown slightly clayey fine to coarse SAND. (WOLSTON SAND AND GRAVEL) 2.40 - 2.45 Thin band of fine and medium angular black gravel, probable coal			WOSG	
							110.29	5.00	Firm dark grey slightly gravelly slightly sandy CLAY. Gravel is fine to coarse angular to rounded of chalk, mudstone and chert. (WOLSTON SAND AND GRAVEL)			WOSG	

Boring Progress						Water Strikes					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt	Date	Time	Strike	Minutes	Standing	Casing
						11-11-19		0.50			

Chiselling				Water Added	
From	To	Hours	Tool	From	To

General Remarks

Hole completed at 5.0m bgl. Groundwater encountered at 0.50m bgl. No visual or olfactory evidence of contamination recorded.

Scale 1:62.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

17 WSP BH LOG WORKHOUSE LANE.GPJ WSPETEMPLATE7.00.GDT 20/12/19

WSP
Level 2, 100 Wharfside Stree, Birmingham
B1 1RT
Telephone:

TRIAL PIT LOG

Project	Job No
Workhouse Lane	70060615



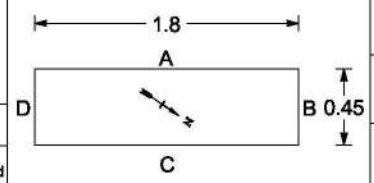


Depth	Type	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thick-ness)	STRATA Description	Legend	Geology	Install / Backfill
						110.16	(0.50) 0.50	Dark brown slightly clayey slightly gravelly fine to coarse SAND with frequent rootlets. Gravel is fine to coarse subangular to rounded of chert. (TOPSOIL)		TS	
						109.96	0.70	Soft dark brown slightly gravelly sandy CLAY. Gravel is fine to coarse angular to rounded of chalkand chert.		ODT	
1.70	B					108.86	(1.10) 1.80	Firm dark orangish brown mottled bluish grey slightly gravelly slightly sandy CLAY. Gravel is fine to coarse angular to well rounded of chalk, chert and mudstone. (OADBY MEMBER)		ODT	

General Remarks
Hole complete at 1.80m bgl. Soakway conducted. No groundwater encountered. No visual or olfactory evidence of contamination recorded.

Shoring/Support: None
Stability: Stable

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.



Length: 1.80m	Logged By: B Fagan	Client:	Sheet: 1 of 1
Width: 0.45m	Ground Level (m AOD): 110.659	Co-Ordinates (NGR): E 444144 N 291783	Date: 12-11-19 / 12-11-19
Orientation: 56 degrees from north	Method/Plant Used: JCB-3CX	Contractor: Lynch Plant & Haulage Limited	Scale: 1:33.3

Trial Hole No.
TP01

08 WSP TP LOG LS 2 PHOTO WORKHOUSE LANE.GPJ WSPETEMPLATE1.03.GDT 20/12/19

WSP
Level 2, 100 Wharfside Stree, Birmingham
B1 1RT
Telephone:

TRIAL PIT LOG

Project	Job No
Workhouse Lane	70060615



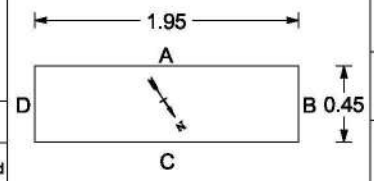


Depth	Type	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thick-ness)	STRATA Description	Legend	Geology	Install / Backfill
						113.07	0.20	Grass over dark brown slightly gravelly slightly clayey fine to coarse SAND with frequent rootlets. Gravel is fine to coarse angular to subrounded of chalk and chert. (TOPSOIL)		TS	
							(0.40)	Firm grey slightly gravelly CLAY. Gravel is fine to coarse angular to subrounded of chalk, chert and mudstone. (Potential reworked OADBY MEMBER)		MG	
						112.67	0.60				
						112.47	0.80	Soft black slightly sandy CLAY with frequent rootlets and occasional black wood fragments. (RELICT TOPSOIL)		TS	
					1		(1.20)	Soft orangish brown occasionally grey very sandy CLAY. Gravel is fine to coarse angular to subrounded of chalk, chert and mudstone. (OADBY MEMBER) 1.50 - 2.00 Becoming mottled orangish brown		ODT	
						111.27	2.00				
					1	111.07	2.20	Brownish orange gravelly fine to coarse SAND. Gravel is fine to coarse angular to well rounded of chalk, mudstone and chert. (WOLSTON SAND AND GRAVEL)		WOSG	

General Remarks
Hole terminated at 2.20m bgl on encoubter of groundwater within sands. No soakway completed. No visual or olfactory evidence of contamination recorded.

Shoring/Support: None
Stability: Stable

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.



Length: 1.95m	Logged By: B Fagan	Client:		Sheet: 1 of 1
Width: 0.45m	Ground Level (m AOD): 113.270	Co-Ordinates (NGR): E 444245 N 291848	Date: 12-11-19 12-11-19	Trial Hole No. TP02
Orientation: 33 degrees from north	Method/Plant Used: JCB-3CX	Contractor: Lynch Plant & Haulage Limited	Scale: 1:33.3	

08 WSP TP LOG LS 2 PHOTO WORKHOUSE LANE.GPJ WSPETEMPLATE1.03.GDT 20/12/19

WSP
Level 2, 100 Wharfside Stree, Birmingham
B1 1RT
Telephone:

TRIAL PIT LOG

Project	Job No
Workhouse Lane	70060615



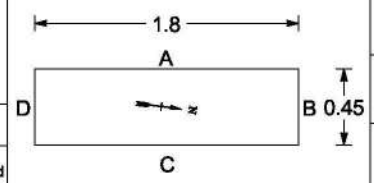


Depth	Type	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thick-ness)	STRATA Description	Legend	Geology	Install / Backfill
						115.02	(0.30) 0.30	Grass over soft orangish brown very sandy CLAY with frequent rootlets. (TOPSOIL)		TS	
						114.72	(0.30) 0.60	Soft locally very soft orangish brown mottled dark grey very sandy CLAY. (ALLUVIUM)		ALV	
							(1.20)	Firm locally soft mottled orangish grey occasionally dark brown slightly gravelly sandy CLAY. Gravel is fine to coarse angular to well rounded of chalk, mudstone and chert. (OADBY MEMBER)		ODT	
1.80	B					113.52	1.80				

General Remarks
Hole completed at 1.80m bgl. Soakway conducted. No groundwater encountered. No visual or olfactory evidence of contamination recorded.

Shoring/Support: None
Stability: Stable

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.



Length	Logged By	Client	Sheet
1.80m	B Fagan		1 of 1
Width 0.45m	**Ground Level (m AOD)** 115.316	**Co-Ordinates (NGR)** E 444264 N 291903	**Date** 12-11-19 12-11-19
Orientation 83 degrees from north	**Method/Plant Used** JCB-3CX	**Contractor** Lynch Plant & Haulage Limited	**Scale** 1:33.3

Trial Hole No.
TP03

08 WSP TP LOG LS 2 PHOTO WORKHOUSE LANE.GPJ WSPETEMPLATE1.03.GDT 20/12/19

WSP
Level 2, 100 Wharfside Stree, Birmingham
B1 1RT
Telephone:

TRIAL PIT LOG

Project	Job No
Workhouse Lane	70060615



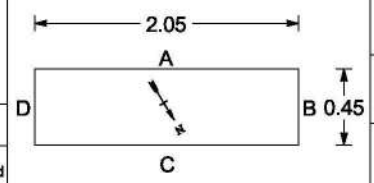


Depth	Type	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thick-ness)	STRATA Description	Legend	Geology	Install / Backfill
						111.73	(0.30) 0.30	Grass over dark brown slightly gravelly slightly clayey fine to coarse SAND with frequent rootlets. Gravel is fine to coarse angular to rounded of chert. (TOPSOIL)		TS	
							(1.10)	Firm grey slightly gravelly slightly sandy CLAY. Gravel is fine to coarse angular to well rounded of chalk, chert and mudstone. (ALLUVIUM)		ALV	
						110.63	1.40				
							(0.80)	Dark orangish brown occasionally grey slightly gravelly fine to coarse SAND. (WOLSTON SAND AND GRAVEL)		WOSG	
						109.83	2.20				

General Remarks
Hole completed at 2.20m bgl. Soakway conducted in sand strata, too much collapse for accurate soakway. No groundwater encountered. No visual or olfactory evidence of contamination recorded.

Shoring/Support: None
Stability: Stable

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.



Length: 2.05m	Logged By: B Fagan	Client:	Sheet: 1 of 1
Width: 0.45m	Ground Level (m AOD): 112.028	Co-Ordinates (NGR): E 444197 N 291821	Date: 12-11-19 / 12-11-19
Orientation: 31 degrees from north	Method/Plant Used: JCB-3CX	Contractor: Lynch Plant & Haulage Limited	Scale: 1:33.3

Trial Hole No.
TP04

08 WSP TP LOG LS 2 PHOTO WORKHOUSE LANE.GPJ WSPETEMPLATE1.03.GDT 20/12/19

APPENDIX E

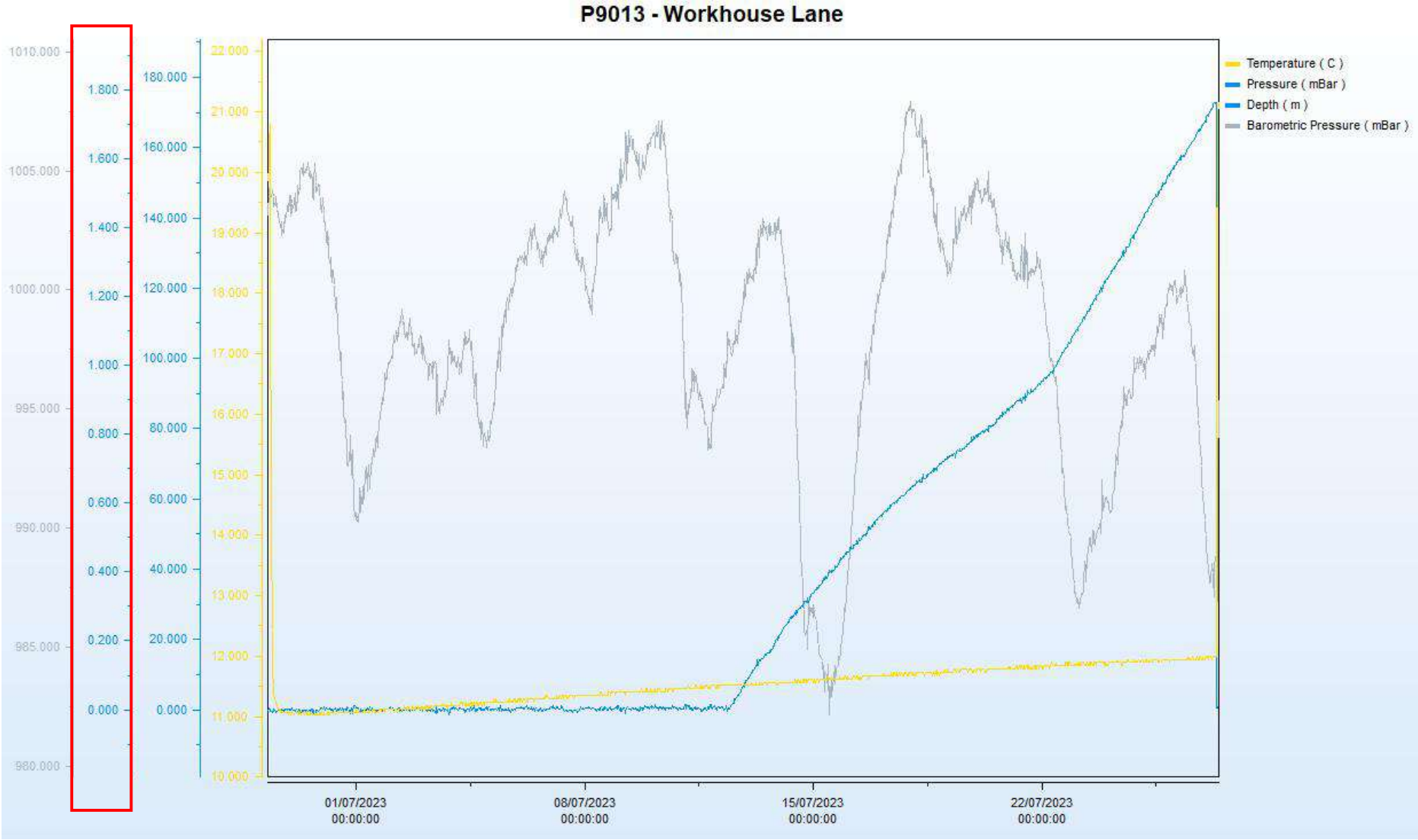


NOTES:
NOTES

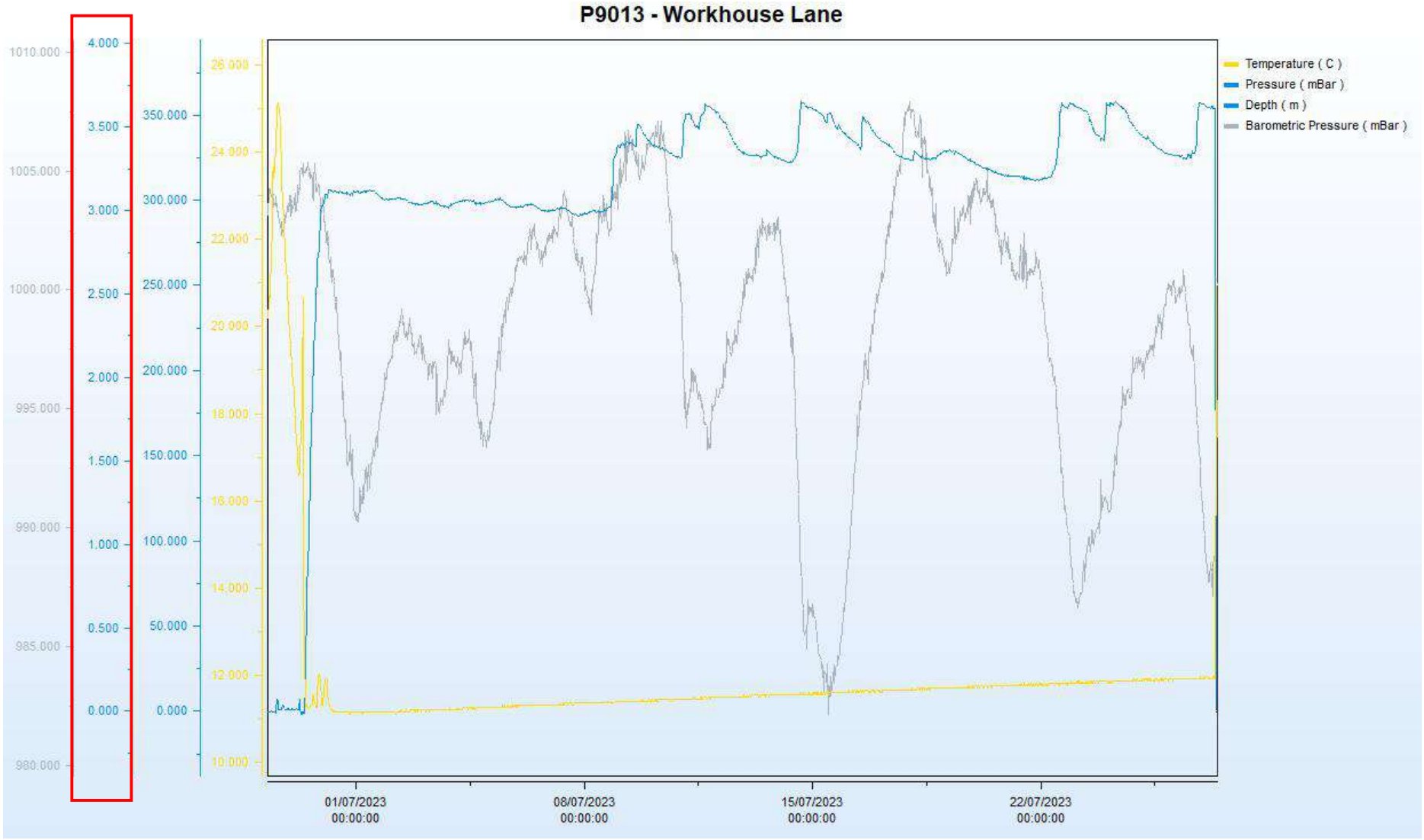
CLIENT: MATHER JAMIE	PROJECT P9013	DATE 07/2023	DESIGN/ AM
PROJECT: LAND OFF WORKHOUSE LANE, BURBAGE, HINCKLEY	DRAWING 004	ISSUE: DRAFT	
TITLE: GROUNDWATER MONITORING PLAN			

© GRM Development Solutions Ltd © Crown Copyright.
AL 100014100

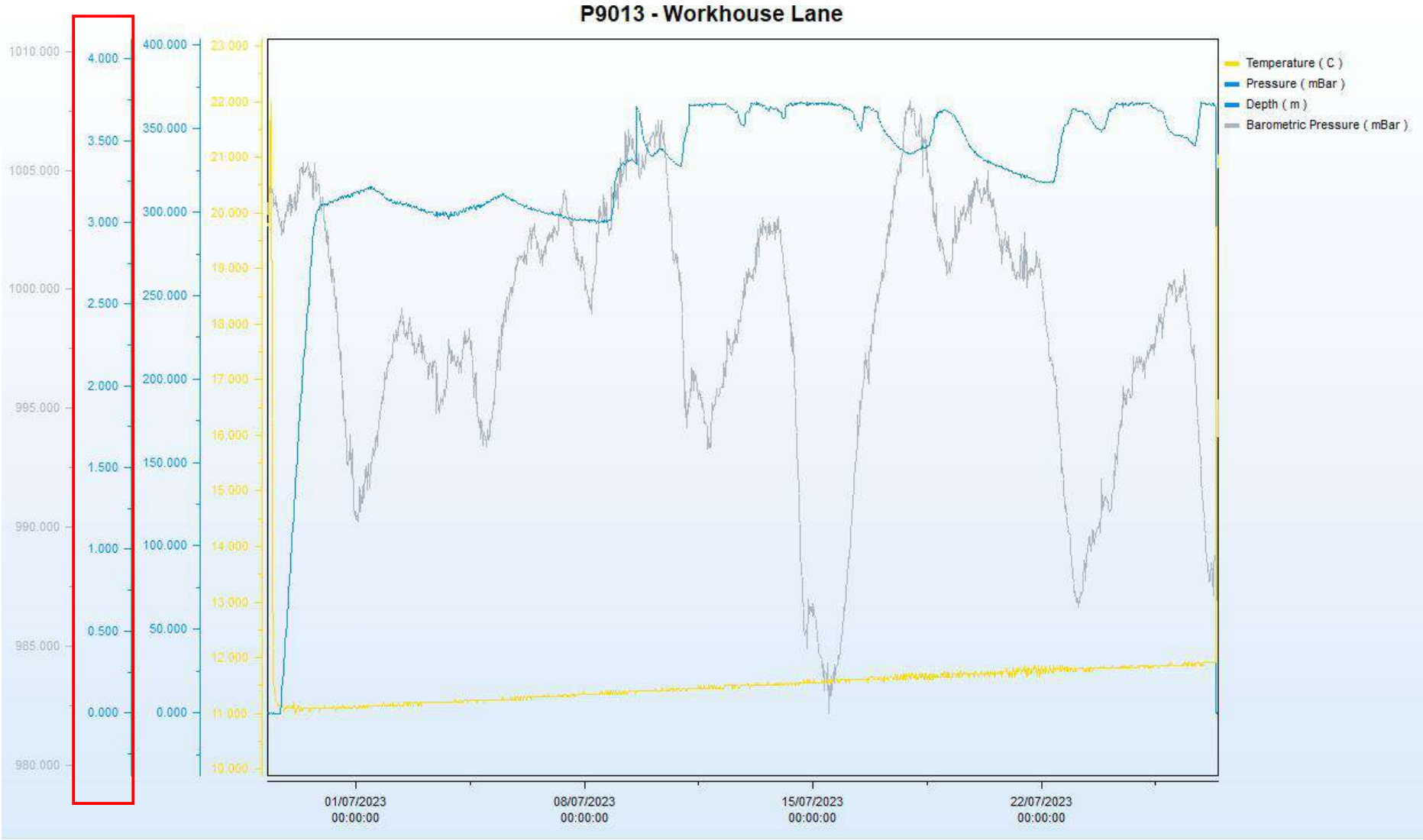
GRM Development Solutions Ltd
Tel: 01283 551 249
mail@grm-uk.com www.grm-uk.com


P9013 - Workhouse Lane
Temperature (C)
Pressure (mBar)
Depth (m)
Barometric Pressure (mBar)
1010.000
1005.000
1000.000
995.000
990.000
985.000
980.000
1.800
1.600
1.400
1.200
1.000
0.800
0.600
0.400
0.200
0.000
180.000
160.000
140.000
120.000
100.000
80.000
60.000
40.000
20.000
0.000
22.000
21.000
20.000
19.000
18.000
17.000
16.000
15.000
14.000
13.000
12.000
11.000
10.000
01/07/2023
00:00:00
08/07/2023
00:00:00
15/07/2023
00:00:00
22/07/2023
00:00:00

Logger F

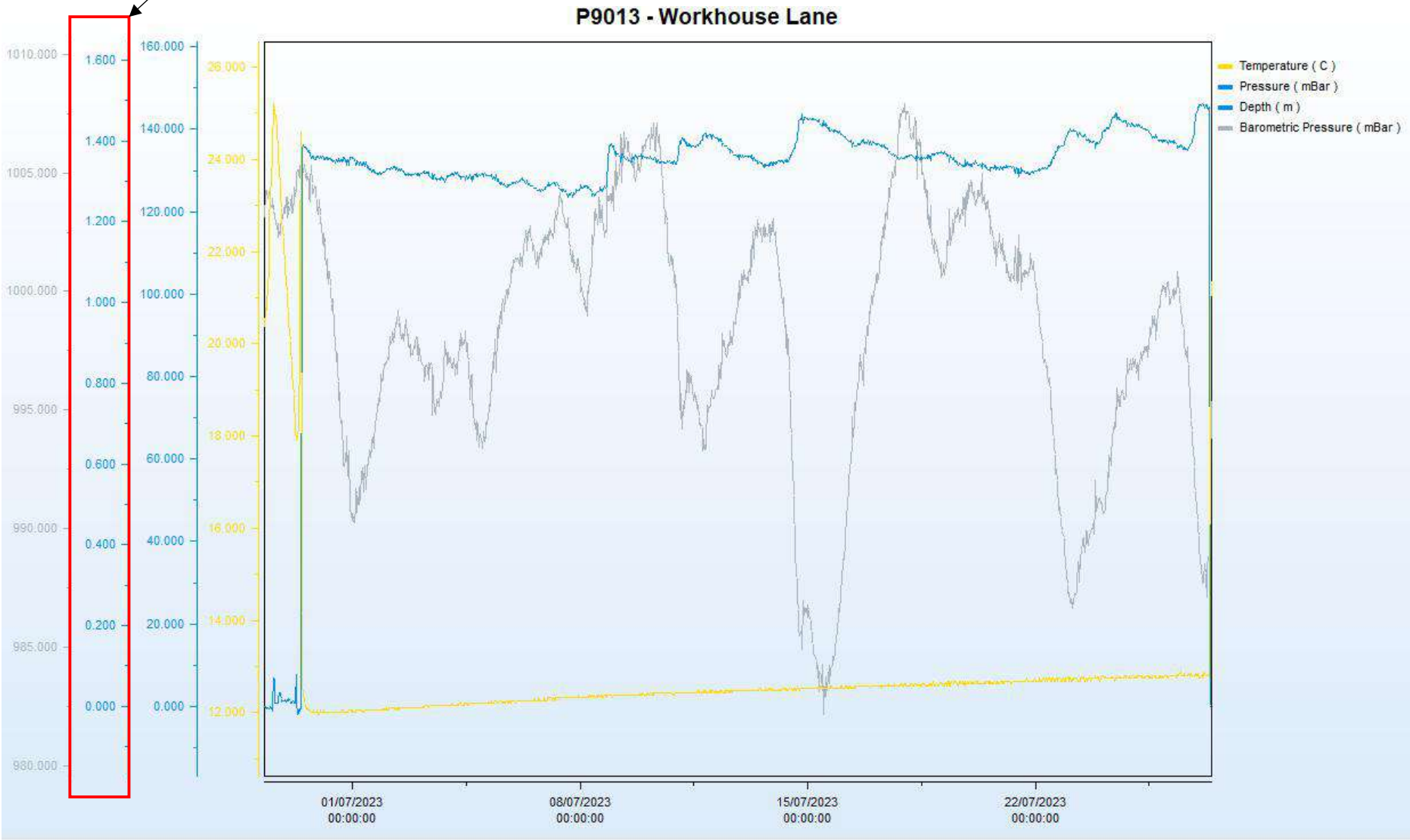

P9013 - Workhouse Lane
Temperature (C)
Pressure (mBar)
Depth (m)
Barometric Pressure (mBar)
1010.000
1005.000
1000.000
995.000
990.000
985.000
980.000
4.000
3.500
3.000
2.500
2.000
1.500
1.000
0.500
0.000
350.000
300.000
250.000
200.000
150.000
100.000
50.000
0.000
26.000
24.000
22.000
20.000
18.000
16.000
14.000
12.000
10.000
01/07/2023
00:00:00
08/07/2023
00:00:00
15/07/2023
00:00:00
22/07/2023
00:00:00

Logger G

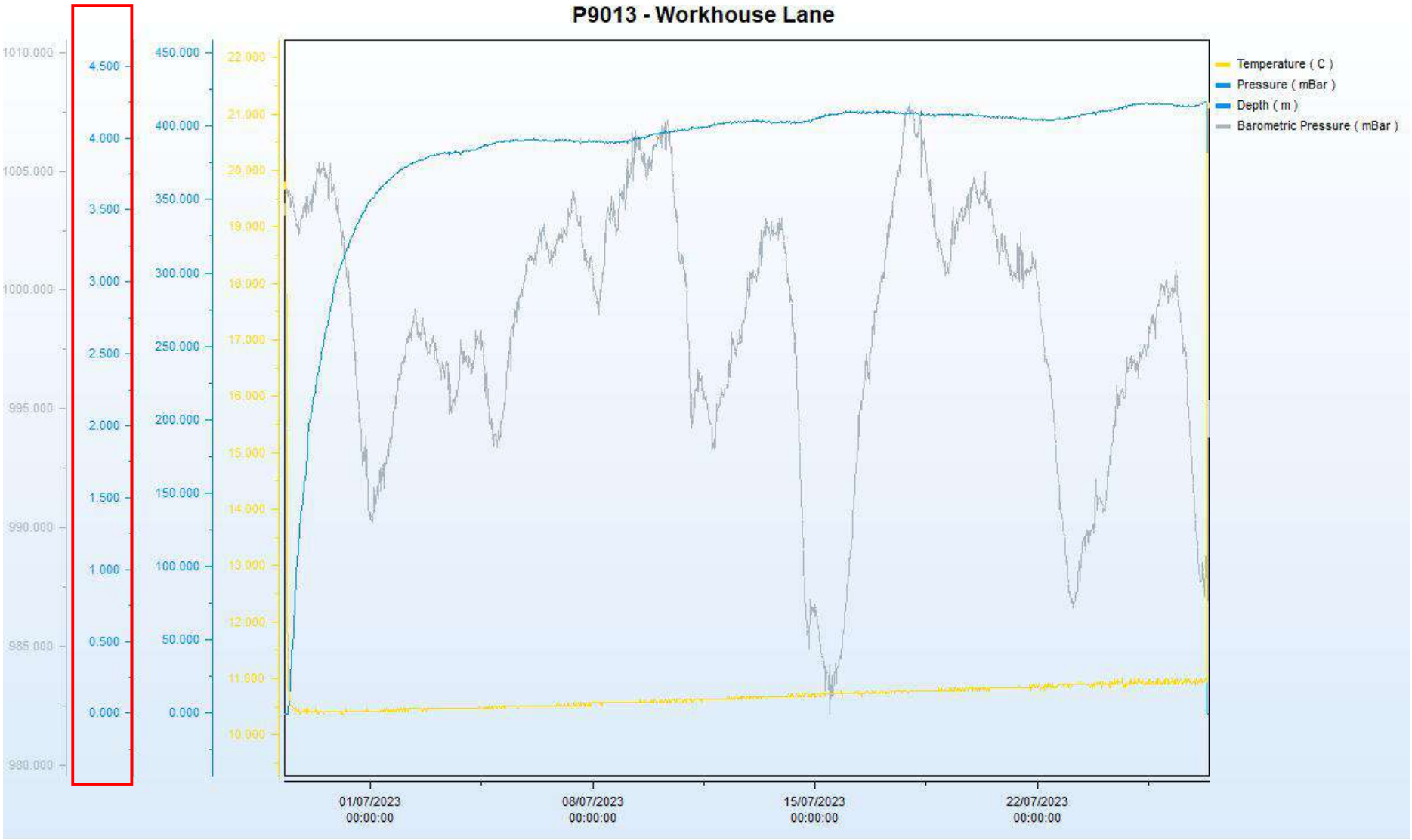

P9013 - Workhouse Lane
Temperature (C)
Pressure (mBar)
Depth (m)
Barometric Pressure (mBar)
1010.000
1005.000
1000.000
995.000
990.000
985.000
980.000
4.000
3.500
3.000
2.500
2.000
1.500
1.000
0.500
0.000
400.000
350.000
300.000
250.000
200.000
150.000
100.000
50.000
0.000
23.000
22.000
21.000
20.000
19.000
18.000
17.000
16.000
15.000
14.000
13.000
12.000
11.000
10.000
01/07/2023
00:00:00
08/07/2023
00:00:00
15/07/2023
00:00:00
22/07/2023
00:00:00

Logger K

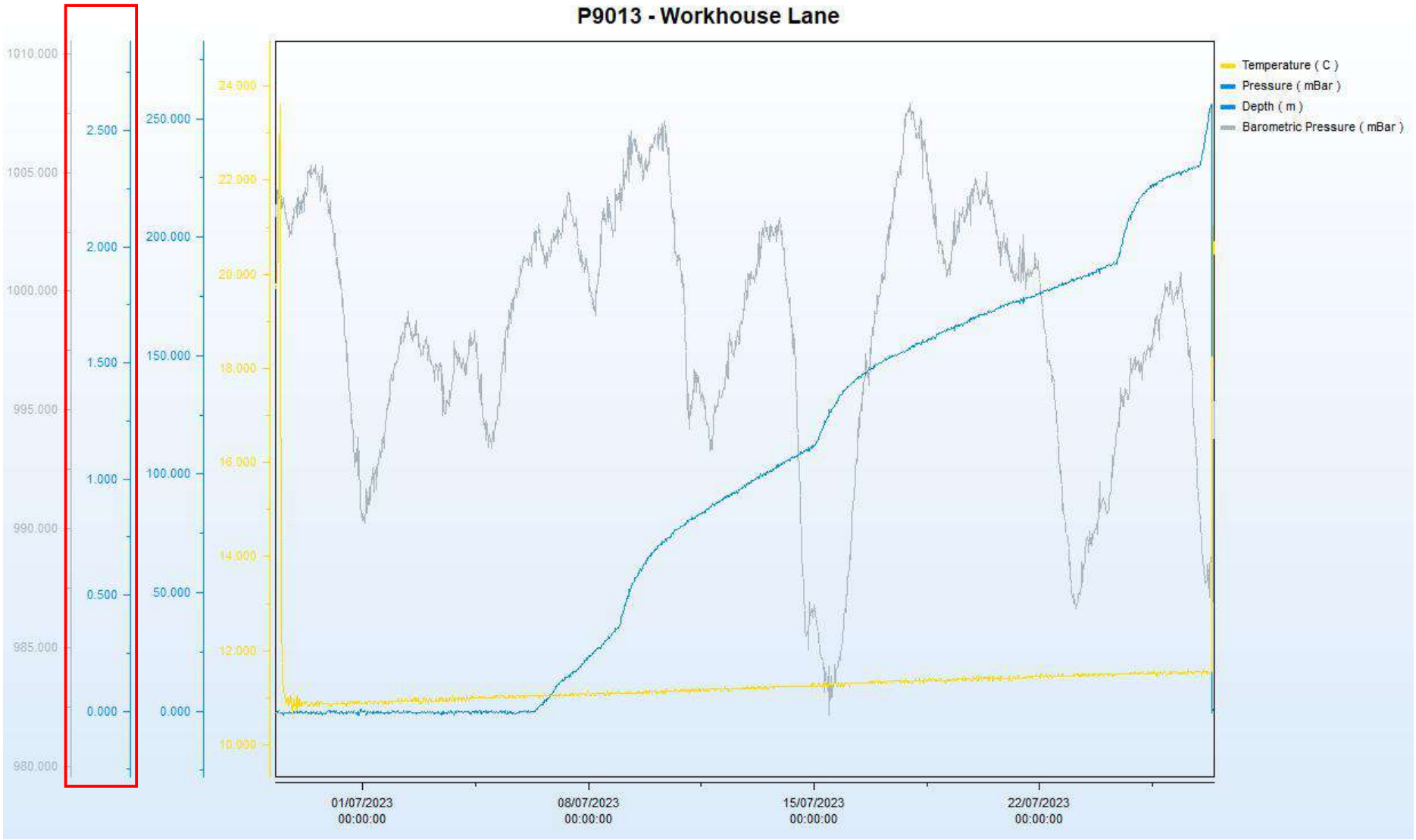
Range on axis may change depending on range of groundwater levels.



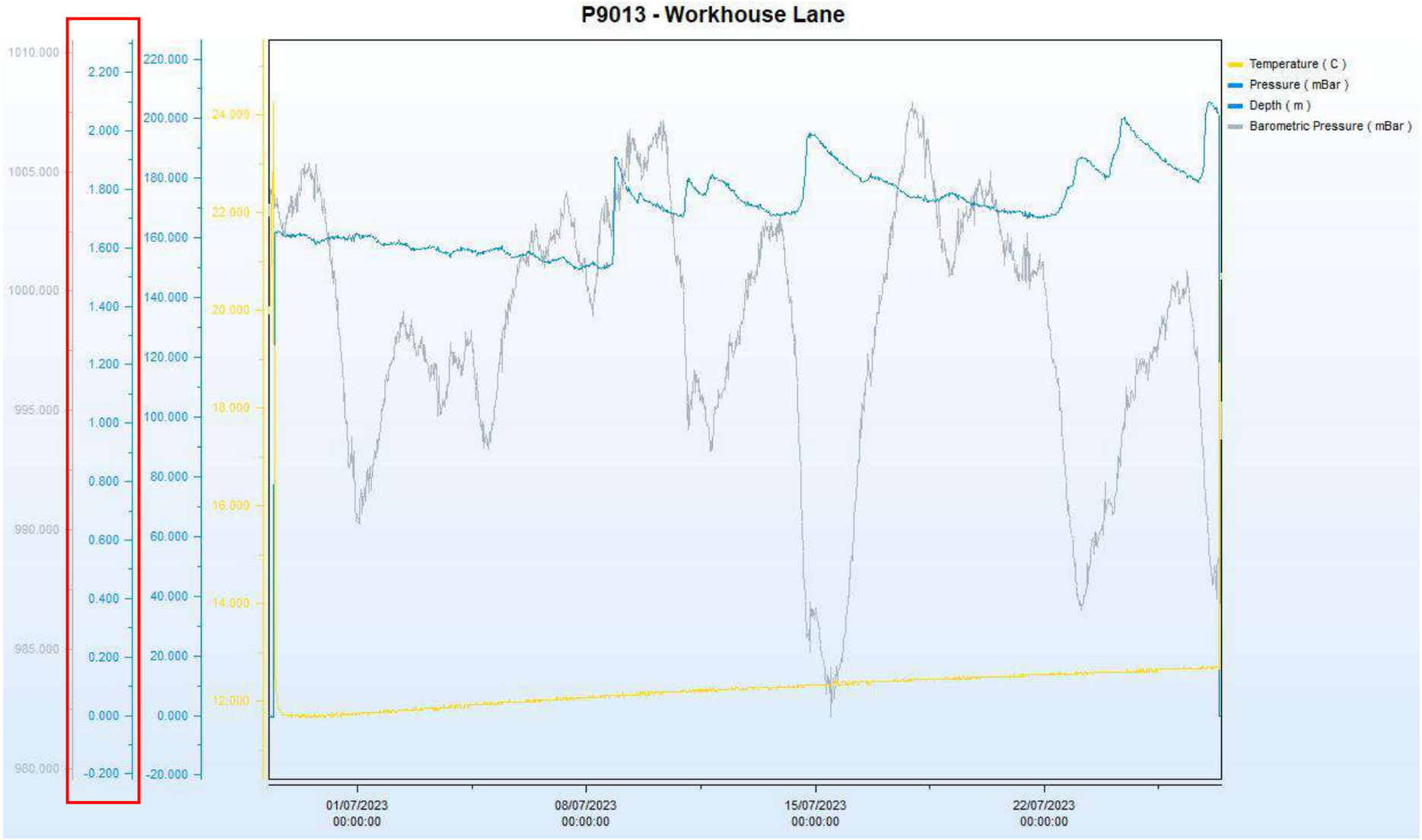
Logger L


P9013 - Workhouse Lane
Temperature (C)
Pressure (mBar)
Depth (m)
Barometric Pressure (mBar)
1010.000
1005.000
1000.000
995.000
990.000
985.000
980.000
4.500
4.000
3.500
3.000
2.500
2.000
1.500
1.000
0.500
0.000
450.000
400.000
350.000
300.000
250.000
200.000
150.000
100.000
50.000
0.000
22.000
21.000
20.000
19.000
18.000
17.000
16.000
15.000
14.000
13.000
12.000
11.000
10.000
01/07/2023
00:00:00
08/07/2023
00:00:00
15/07/2023
00:00:00
22/07/2023
00:00:00

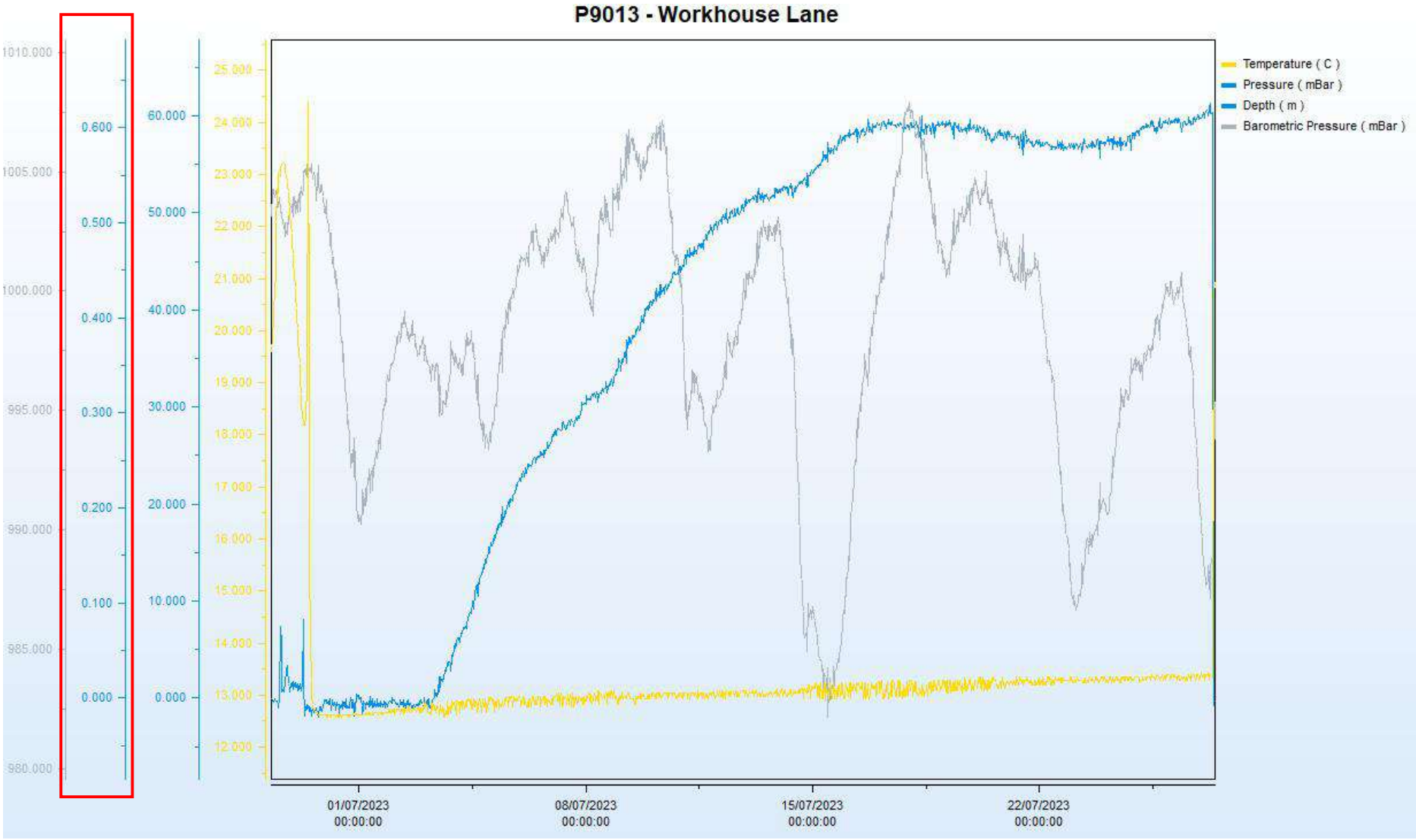
Logger T


P9013 - Workhouse Lane
Temperature (C)
Pressure (mBar)
Depth (m)
Barometric Pressure (mBar)
1010.000
1005.000
1000.000
995.000
990.000
985.000
980.000
2.500
2.000
1.500
1.000
0.500
0.000
250.000
200.000
150.000
100.000
50.000
0.000
24.000
22.000
20.000
18.000
16.000
14.000
12.000
10.000
01/07/2023
00:00:00
08/07/2023
00:00:00
15/07/2023
00:00:00
22/07/2023
00:00:00

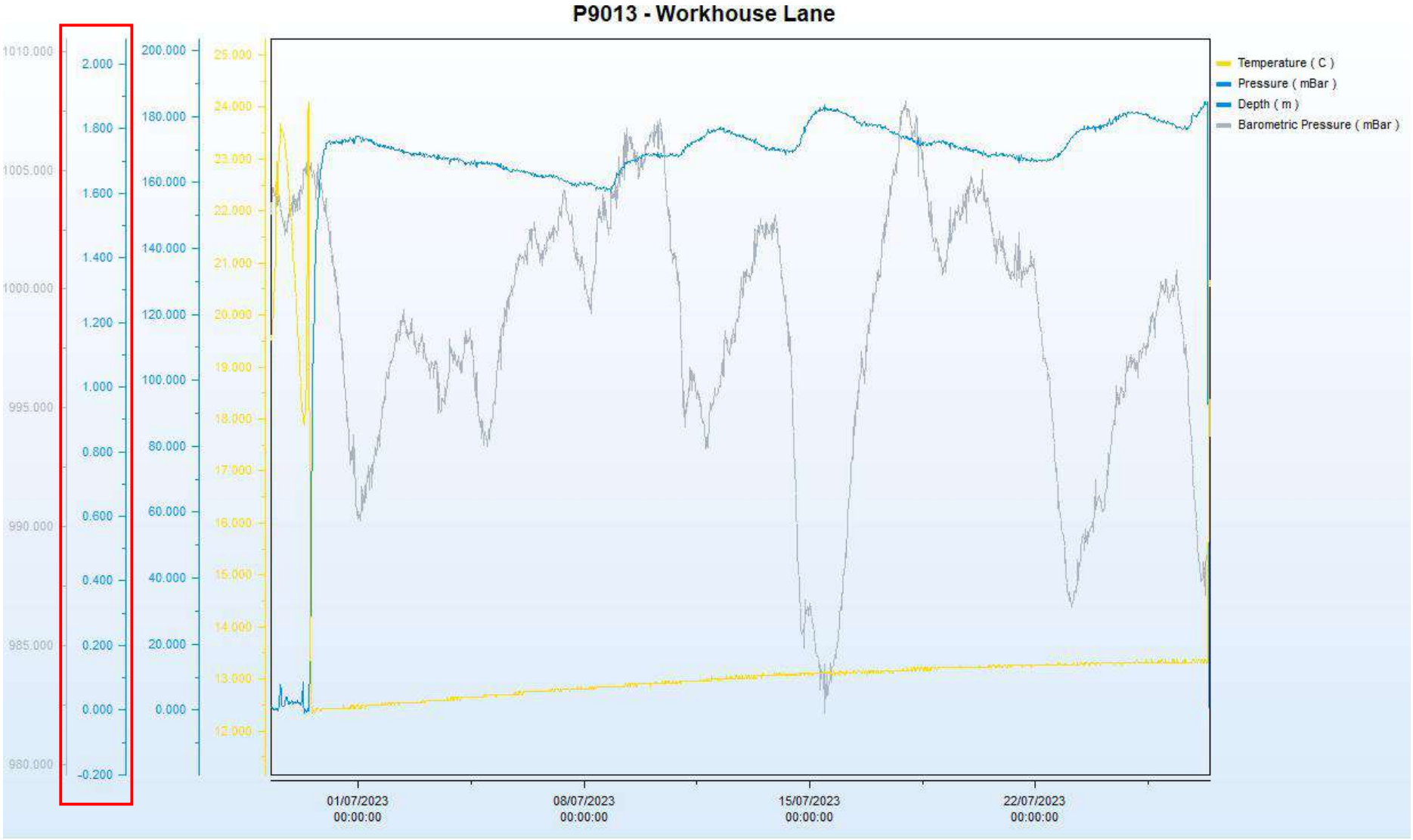
Logger U


P9013 - Workhouse Lane
Temperature (C)
Pressure (mBar)
Depth (m)
Barometric Pressure (mBar)
1010.000
1005.000
1000.000
995.000
990.000
985.000
980.000
2.200
2.000
1.800
1.600
1.400
1.200
1.000
0.800
0.600
0.400
0.200
0.000
-0.200
220.000
200.000
180.000
160.000
140.000
120.000
100.000
80.000
60.000
40.000
20.000
0.000
-20.000
24.000
22.000
20.000
18.000
16.000
14.000
12.000
01/07/2023
00:00:00
08/07/2023
00:00:00
15/07/2023
00:00:00
22/07/2023
00:00:00

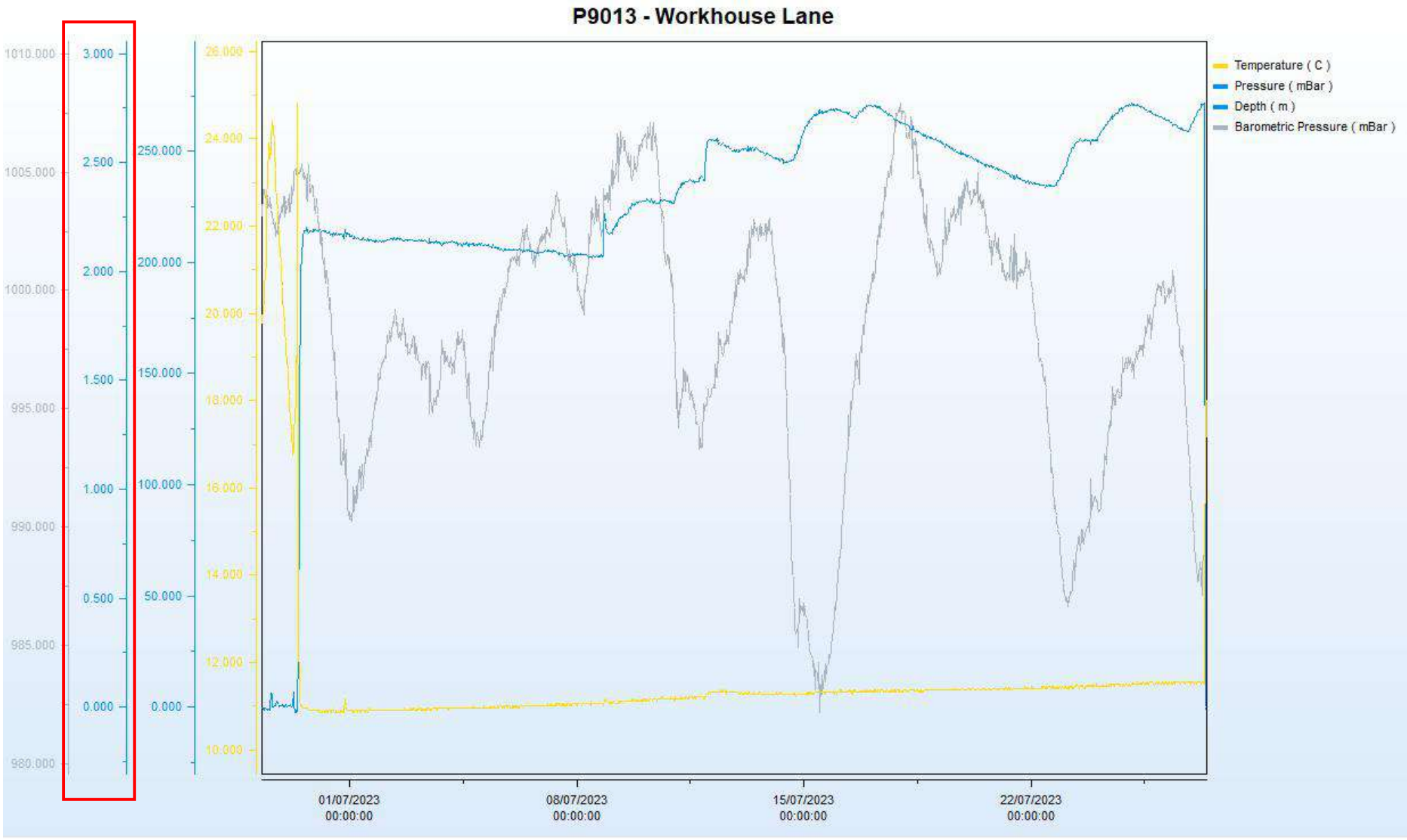
Logger V


P9013 - Workhouse Lane
Temperature (C)
Pressure (mBar)
Depth (m)
Barometric Pressure (mBar)
1010.000
1005.000
1000.000
995.000
990.000
985.000
980.000
0.600
0.500
0.400
0.300
0.200
0.100
0.000
60.000
50.000
40.000
30.000
20.000
10.000
0.000
25.000
24.000
23.000
22.000
21.000
20.000
19.000
18.000
17.000
16.000
15.000
14.000
13.000
12.000
01/07/2023
00:00:00
08/07/2023
00:00:00
15/07/2023
00:00:00
22/07/2023
00:00:00

Logger W


P9013 - Workhouse Lane
Temperature (C)
Pressure (mBar)
Depth (m)
Barometric Pressure (mBar)
1010.000
1005.000
1000.000
995.000
990.000
985.000
980.000
2.000
1.800
1.600
1.400
1.200
1.000
0.800
0.600
0.400
0.200
0.000
-0.200
200.000
180.000
160.000
140.000
120.000
100.000
80.000
60.000
40.000
20.000
0.000
25.000
24.000
23.000
22.000
21.000
20.000
19.000
18.000
17.000
16.000
15.000
14.000
13.000
12.000
01/07/2023
00:00:00
08/07/2023
00:00:00
15/07/2023
00:00:00
22/07/2023
00:00:00

Logger X


P9013 - Workhouse Lane
Temperature (C)
Pressure (mBar)
Depth (m)
Barometric Pressure (mBar)
1010.000
1005.000
1000.000
995.000
990.000
985.000
980.000
3.000
2.500
2.000
1.500
1.000
0.500
0.000
250.000
200.000
150.000
100.000
50.000
0.000
26.000
24.000
22.000
20.000
18.000
16.000
14.000
12.000
10.000
01/07/2023
00:00:00
08/07/2023
00:00:00
15/07/2023
00:00:00
22/07/2023
00:00:00

Logger Y

APPENDIX F

7 - 11 Harding Street
Leicester
LE1 4DH

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

Analytical Test Report: L23/03199/GRM - 23-35082

Your Project Reference:	**P9013 Workhouse Lane Burbage**		
Your Order Number:	P9013	Samples Received / Instructed:	06/07/2023 / 06/07/2023
Report Issue Number:	1	Sample Tested:	06/07 to 13/07/2023
Samples Analysed:	7 soil samples	Report issued:	13/07/2023

Signed



James Gane
Analytical Services Manager
CTS Group

Notes:

General

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

Samples will be retained for 14 days after issue of this report 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

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: 06.07.23

Issued by: J. Gane

Issue No: 4

Rev No: 1

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L23/03199/GRM - 23-35082

Project Reference - P9013 Workhouse Lane Burbage

Analytical Test Results - Chemical Analysis

Lab Reference			303114	303115	303116	303117	303118	303119	303120
Client Sample ID			-	-	-	-	-	-	-
Client Sample Location			WS02	WS03	WS05	WS05	WS07	WS09	WS10
Client Sample Type			-	-	-	-	-	-	-
Client Sample Number			-	-	-	-	-	-	-
Depth - Top (m)			1.10	1.50	1.20	1.80	1.50	0.90	0.80
Depth - Bottom (m)			1.20	1.60	1.30	1.90	1.60	1.00	0.90
Date of Sampling			28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
Time of Sampling			-	-	-	-	-	-	-
Sample Matrix			Sand	Clay	Sand	Sand	Clay	Sand	Clay
Determinant	**Units**	**Accreditation**							
Water soluble sulphate (as SO_4)	(mg/l)	u	12	97	110	140	16	20	< 10
pH Value	pH Units	MCERTS	8.6	8.4	8.4	8.3	7.8	6.3	8.3

7 - 11 Harding Street
Leicester
LE1 4DH

L23/03199/GRM - 23-35082

Project Reference - P9013 Workhouse Lane Burbage

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 (%)
303114	-	WS02	-	-	Light brown slightly gravelly silty sand	-	-	100
303115	-	WS03	-	-	Reddish grey slightly gravelly clay	-	-	100
303116	-	WS05	-	-	Brown slightly gravelly sand with rare organic matter	-	-	100
303117	-	WS05	-	-	Brown silty sand	-	-	100
303118	-	WS07	-	-	Orangish light brown sandy clay with occasional organic matter	-	-	100
303119	-	WS09	-	-	Light brown slightly gravelly slightly clayey sand with occasional rootlets	-	-	100
303120	-	WS10	-	-	Orangish brown slightly silty sandy clay with rare rootlets chalk	-	-	100

7 - 11 Harding Street
Leicester
LE1 4DH

L23/03199/GRM - 23-35082

Project Reference - P9013 Workhouse Lane Burbage

Sample Comments

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Comments
303114	-	WS02	-	-	
303115	-	WS03	-	-	
303116	-	WS05	-	-	
303117	-	WS05	-	-	
303118	-	WS07	-	-	
303119	-	WS09	-	-	
303120	-	WS10	-	-	

7 - 11 Harding Street
Leicester
LE1 4DH

L23/03199/GRM - 23-35082

Project Reference - P9013 Workhouse Lane Burbage

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preperation	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
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)
SAMPLEPREP	MS - CL - Sample Preparation	-	-	Preparation of samples (including determination of moisture content) to allow for subsequent analysis

7 - 11 Harding Street
Leicester
LE1 4DH

L23/03199/GRM - 23-35082

Project Reference - P9013 Workhouse Lane Burbage

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 - Date of sampling to receipt insufficient to allow analysis to be completed without deviation, Please note this is only a deviation if 'X' is also recorded against the sample

Observations whist 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
303114	-	WS02	-	-	MS - CL - pH in Soils	RX
303115	-	WS03	-	-	MS - CL - pH in Soils	RX
303116	-	WS05	-	-	MS - CL - pH in Soils	RX
303117	-	WS05	-	-	MS - CL - pH in Soils	RX
303118	-	WS07	-	-	MS - CL - pH in Soils	RX
303119	-	WS09	-	-	MS - CL - pH in Soils	RX
303120	-	WS10	-	-	MS - CL - pH in Soils	RX

7 - 11 Harding Street
Leicester
LE1 4DH

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

Analytical Test Report: L23/03087/GRM - 23-34960

Your Project Reference:	**P9013 Workhouse Lane, Burbage**		
Your Order Number:	P9013	Samples Received / Instructed:	30/06/2023 / 30/06/2023
Report Issue Number:	1	Sample Tested:	30/06 to 07/07/2023
Samples Analysed:	5 soil samples	Report issued:	07/07/2023

Signed



Peter Swanston
Technical 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: 06.07.23

Issued by: J. Gane

Issue No: 4

Rev No: 1

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L23/03087/GRM - 23-34960

Project Reference - P9013 Workhouse Lane, Burbage

Analytical Test Results - Soil

Lab Reference			302247	302248	302249	302250	302251
Client Sample ID			-	-	-	-	-
Client Sample Location			WS01	WS02	WS05	WS07	WS09
Client Sample Type			-	-	-	-	-
Client Sample Number			-	-	-	-	-
Depth - Top (m)			0.10	0.10	0.10	0.10	0.10
Depth - Bottom (m)			0.20	0.20	0.20	0.20	0.20
Date of Sampling			28/06/2023	28/06/2023	28/06/2023	29/06/2023	29/06/2023
Time of Sampling			-	-	-	-	-
Sample Matrix			Sand	Sand	Sand	Sand	Sand
Determinant	**Units**	**Accreditation**					
Arsenic	(mg/kg)	MCERTS	14	13	17	< 10	11
Cadmium	(mg/kg)	MCERTS	0.7	0.7	1.1	0.5	0.6
Chromium (Total)	(mg/kg)	UKAS	15	15	20	12	16
Copper	(mg/kg)	MCERTS	15	12	27	15	20
Lead	(mg/kg)	MCERTS	47	44	59	42	45
Mercury	(mg/kg)	UKAS	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5
Nickel	(mg/kg)	MCERTS	12	12	18	8.9	11
Selenium	(mg/kg)	u	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
Zinc	(mg/kg)	MCERTS	77	67	120	69	77
Total Phenols	(mg/kg)	MCERTS	< 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
Chromium (Hexavalent)	(mg/kg)	u	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
pH	pH Units	MCERTS	5.7	6.2	5.7	5.7	5.4
Sulphate (Water soluble as SO_4)	(mg/l)	u	< 10	< 10	< 10	< 10	< 10
Acenaphthene	(mg/kg)	MCERTS	< 0.02	< 0.02	0.30	< 0.02	< 0.02
Acenaphthylene	(mg/kg)	UKAS	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Anthracene	(mg/kg)	UKAS	< 0.02	< 0.02	0.65	< 0.02	< 0.02
Benzo (a) anthracene	(mg/kg)	MCERTS	0.03	0.03	1.1	0.03	0.03
Benzo (a) pyrene	(mg/kg)	MCERTS	0.04	0.04	1.1	0.03	0.04
Benzo (b) fluoranthene	(mg/kg)	MCERTS	0.05	0.05	1.3	0.04	0.05
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	0.03	0.02	0.55	< 0.02	0.03
Benzo (k) fluoranthene	(mg/kg)	MCERTS	< 0.02	< 0.02	0.46	< 0.02	< 0.02
Chrysene	(mg/kg)	MCERTS	0.03	0.03	1.2	0.02	0.03
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	< 0.02	< 0.02	0.14	< 0.02	< 0.02
Fluoranthene	(mg/kg)	MCERTS	0.05	0.04	3.0	0.04	0.05
Fluorene	(mg/kg)	MCERTS	< 0.02	< 0.02	0.24	< 0.02	< 0.02
Indeno (1, 2, 3,-cd) pyrene	(mg/kg)	MCERTS	0.03	0.02	0.62	< 0.02	0.02
Naphthalene	(mg/kg)	MCERTS	< 0.02	< 0.02	0.03	< 0.02	< 0.02
Phenanthrene	(mg/kg)	MCERTS	< 0.02	< 0.02	3.1	< 0.02	< 0.02
Pyrene	(mg/kg)	MCERTS	0.05	0.04	2.5	0.04	0.04
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	0.50	0.47	16	0.42	0.47
SOM (via TOC)	(%)	UKAS	7.9	4.6	8.6	5.6	5.4
Pesticide Screen	(mg/kg)	u	Undetected <1mg/kg	-	Detected <1mg/kg EPN	-	Detected <1mg/kg EPN

7 - 11 Harding Street
Leicester
LE1 4DH

L23/03087/GRM - 23-34960

Project Reference - P9013 Workhouse Lane, Burbage

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 (%)
302247	-	WS01	-	-	Brown sandy slightly clayey silt with frequent rootlets	25	< 0.1	97
302248	-	WS02	-	-	Brown sandy slightly clayey silt with frequent rootlets	11	< 0.1	92
302249	-	WS05	-	-	Brown sandy slightly clayey silt with frequent rootlets	14	< 0.1	96
302250	-	WS07	-	-	Brown sandy slightly clayey silt with frequent rootlets	11	< 0.1	96
302251	-	WS09	-	-	Brown sandy slightly clayey silt with frequent rootlets	9.0	< 0.1	95

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L23/03087/GRM - 23-34960

Project Reference - P9013 Workhouse Lane, Burbage

Sample Comments

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Comments
302247	-	WS01	-	-	
302248	-	WS02	-	-	
302249	-	WS05	-	-	
302250	-	WS07	-	-	
302251	-	WS09	-	-	

7 - 11 Harding Street
Leicester
LE1 4DH

L23/03087/GRM - 23-34960

Project Reference - P9013 Workhouse Lane, Burbage

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preperation	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)
PESTS	MS - CL - Pesticides	As received	Passing 10mm test sieve	Determination of pesticides in soils via GC-MS, results based on as received analysis
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

APPENDIX G

MURRAY RIX

CONSULTANCY, SITE INVESTIGATION
CONSTRUCTION MATERIALS TESTING

TEST REPORT

Client	GRM Development Solutions Ltd
Address	Laurus House 1st Avenue Centrum 100 Burton-on-Trent Staffordshire DE14 2WH
Contract	Workhouse Lane, Burbage
Job Number	MRN 4650/55
Date of Issue	12 July 2023
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.

MURRAY RIX

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

UKAS TESTING 1580

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

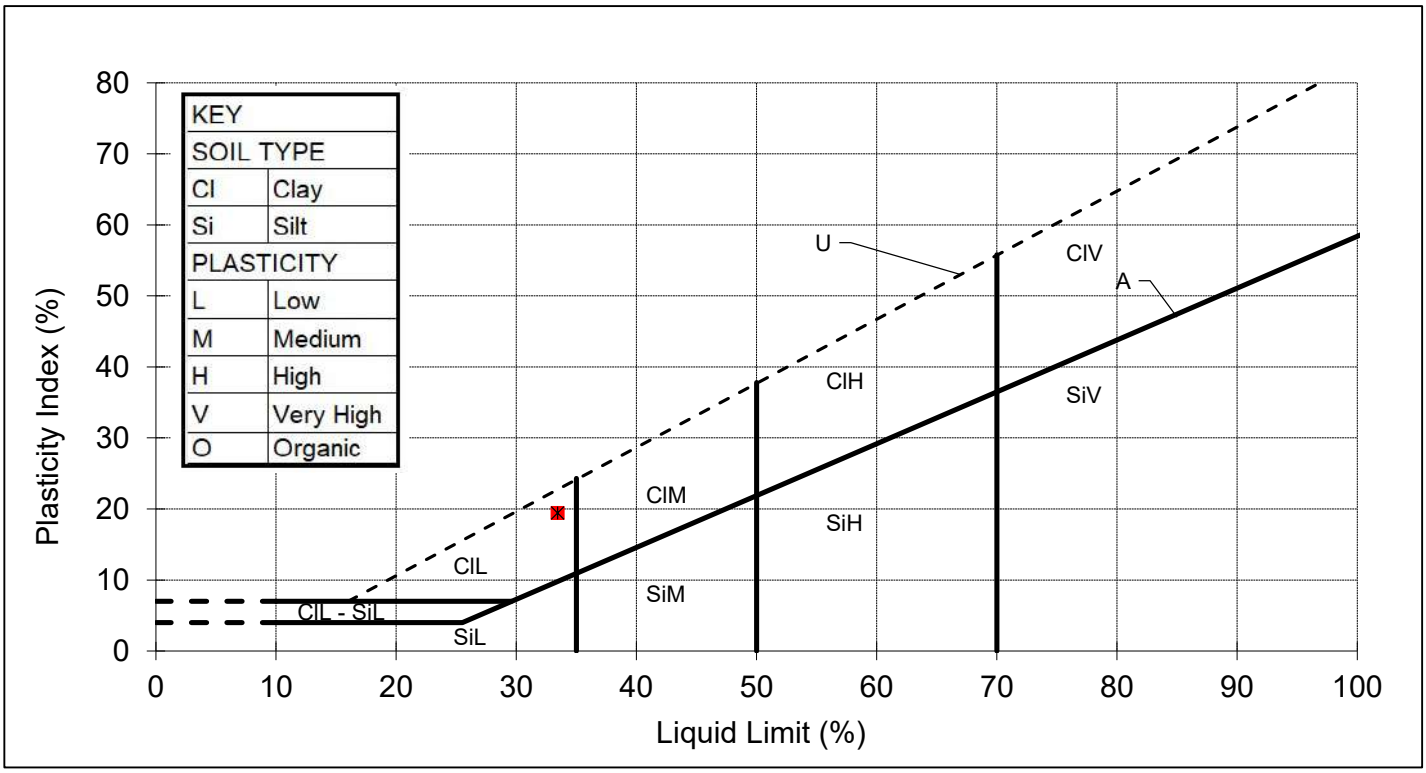
CLIENT	GRM Development Solutions Ltd
SITE	Workhouse Lane, Burbage
JOB NUMBER	MRN 4650/55

SAMPLE LABEL	WS03 1.5-1.6m	DATE SAMPLED	28-Jun-23
SAMPLE No.	128111	DATE RECEIVED	05-Jul-23
DATE TESTED	07-Jul-23	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)	18.6	32.8	1.021	
Determination 2 (avg)	18.6	32.7		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
19.7	33	14	19	95



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 12-Jul-23

MURRAY RIX

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

UKAS TESTING 1580

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

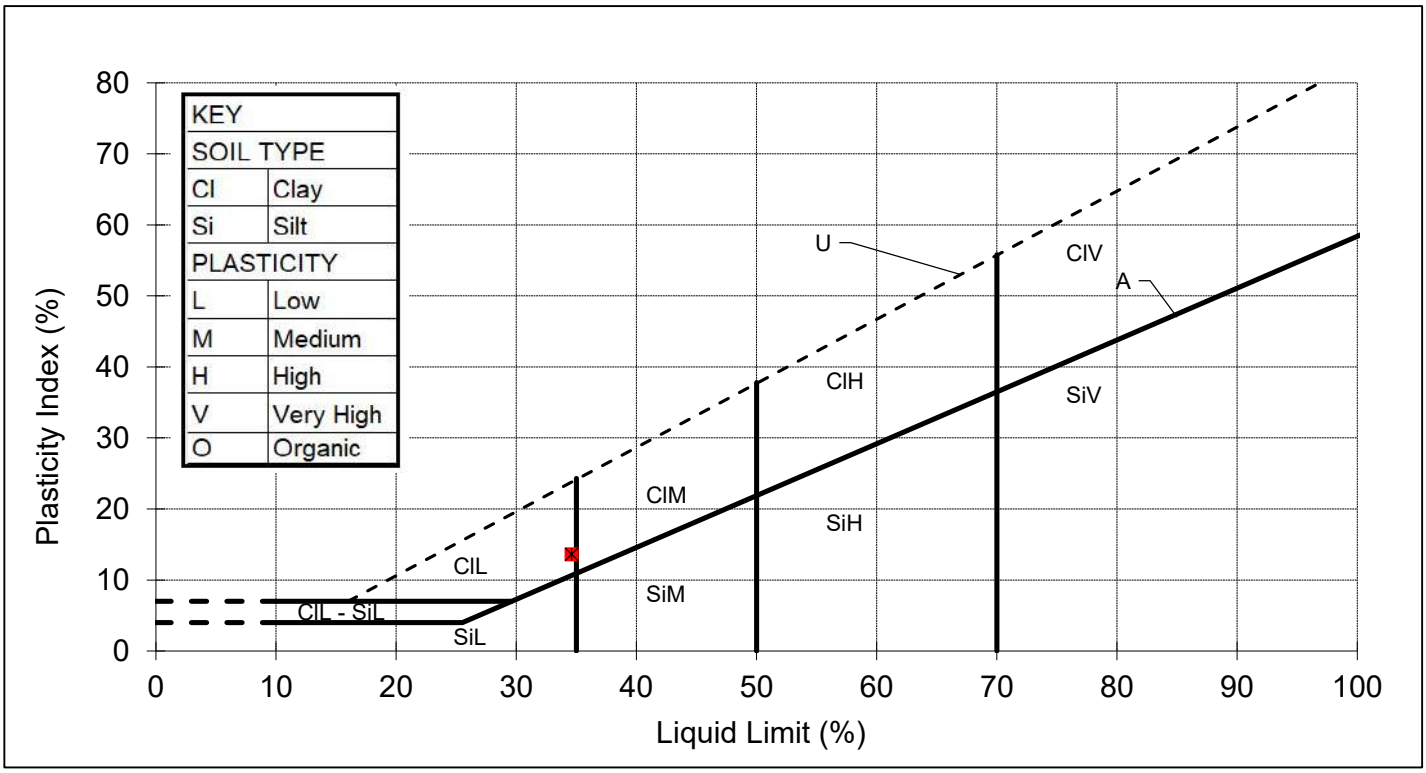
CLIENT	GRM Development Solutions Ltd
SITE	Workhouse Lane, Burbage
JOB NUMBER	MRN 4650/55

SAMPLE LABEL	WS05 1.8-1.9m	DATE SAMPLED	28-Jun-23
SAMPLE No.	128112	DATE RECEIVED	05-Jul-23
DATE TESTED	07-Jul-23	SAMPLED BY	Client

MATERIAL	Brown slightly clayey slightly sandy SILT		
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)	20.7	27.6	1.011	
Determination 2 (avg)	20.6	27.5		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
24.3	35	21	14	100



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 12-Jul-23

MURRAY RIX

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

UKAS TESTING 1580

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

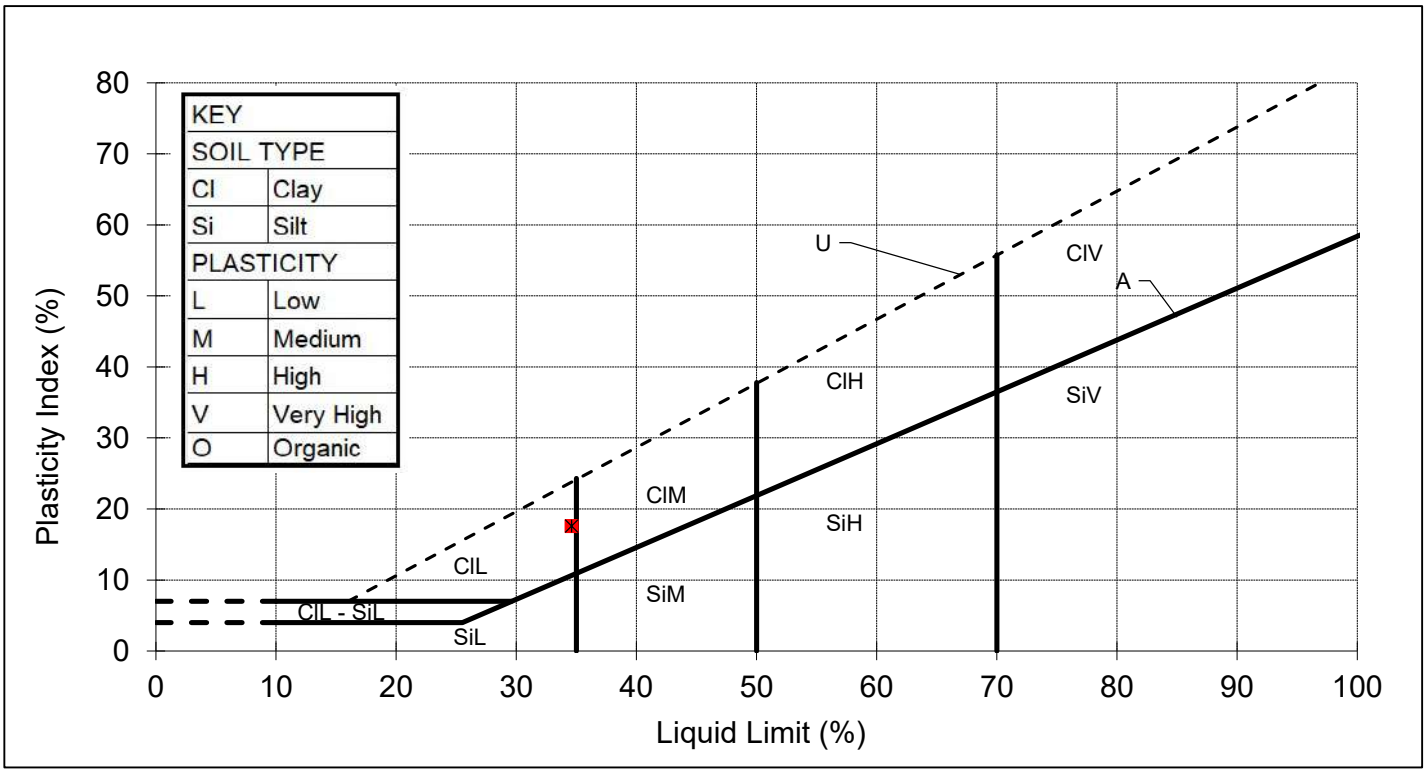
CLIENT	GRM Development Solutions Ltd
SITE	Workhouse Lane, Burbage
JOB NUMBER	MRN 4650/55

SAMPLE LABEL	WS07 1.5-1.6m	DATE SAMPLED	29-Jun-23
SAMPLE No.	128113	DATE RECEIVED	05-Jul-23
DATE TESTED	07-Jul-23	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)	19.4	34.3	1.011	
Determination 2 (avg)	19.2	34.2		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
21.9	35	17	18	94



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 12-Jul-23

MURRAY RIX

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

UKAS TESTING 1580

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

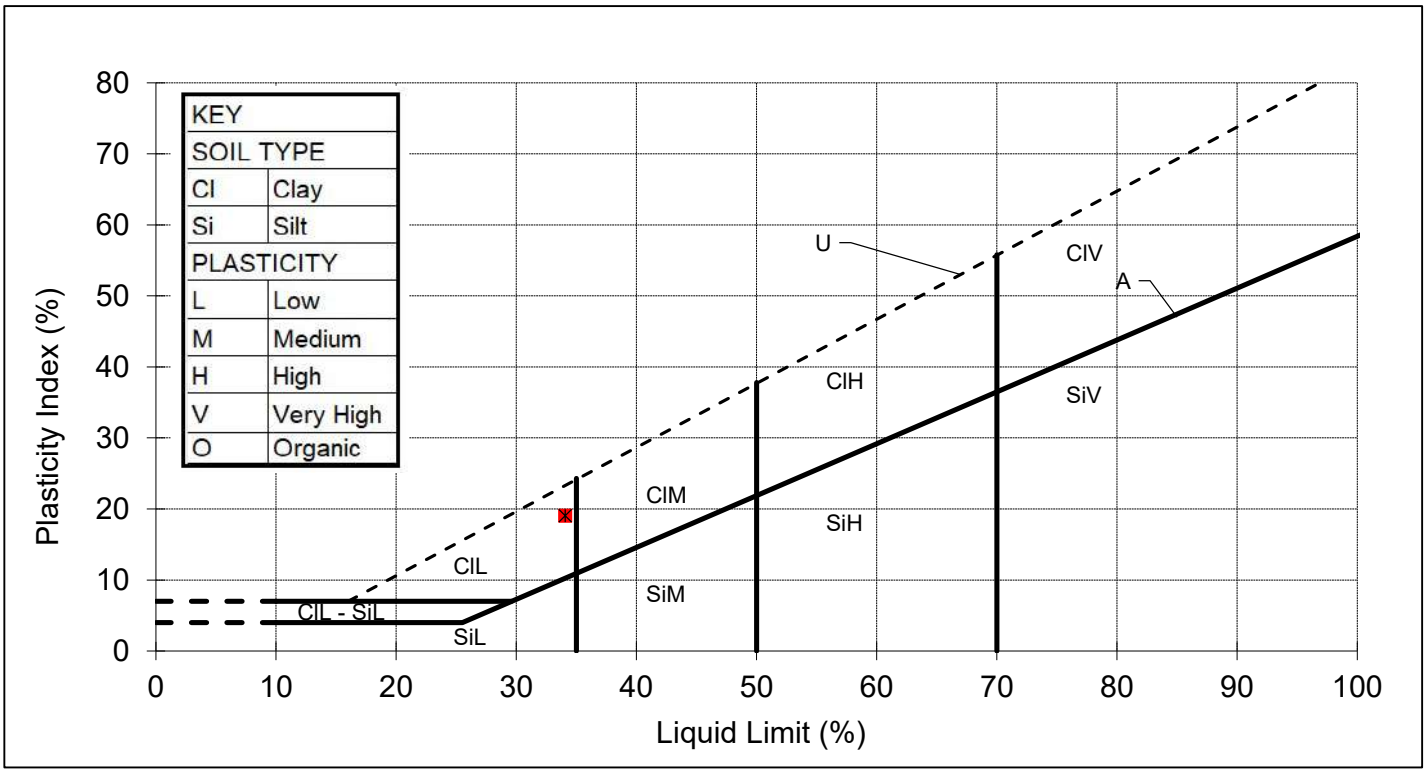
CLIENT	GRM Development Solutions Ltd
SITE	Workhouse Lane, Burbage
JOB NUMBER	MRN 4650/55

SAMPLE LABEL	WS10 0.8-0.9m	DATE SAMPLED	29-Jun-23
SAMPLE No.	128114	DATE RECEIVED	05-Jul-23
DATE TESTED	07-Jul-23	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)	18.5	33.3	1.023	
Determination 2 (avg)	18.4	33.3		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
19.2	34	15	19	95



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 12-Jul-23

MURRAY RIX

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

UKAS TESTING 1580

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

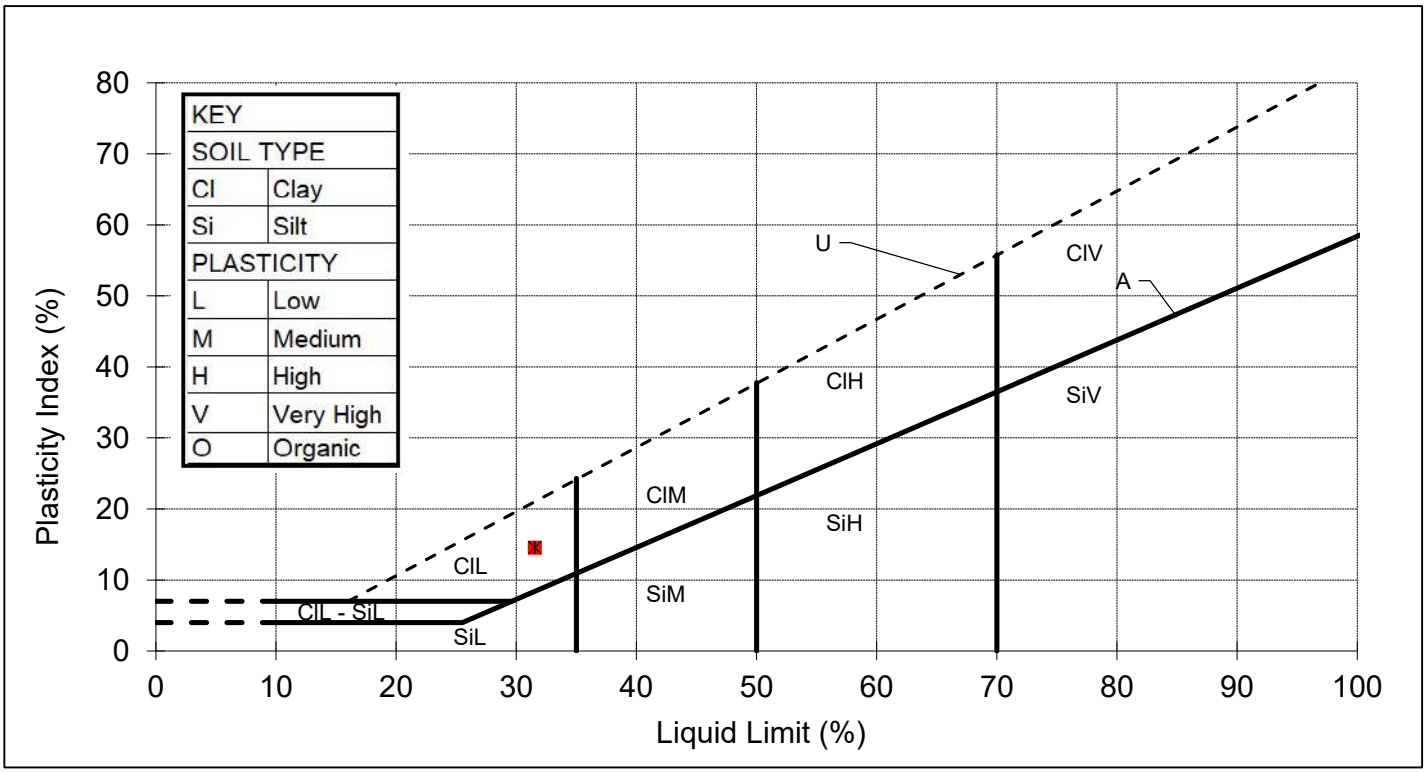
CLIENT	GRM Development Solutions Ltd
SITE	Workhouse Lane, Burbage
JOB NUMBER	MRN 4650/55

SAMPLE LABEL	WS06 1.5-1.6m	DATE SAMPLED	29-Jun-23
SAMPLE No.	128115	DATE RECEIVED	05-Jul-23
DATE TESTED	07-Jul-23	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	30.1	1.036	
Determination 2 (avg)	17.5	30.8		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
18.4	32	17	15	91



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 12-Jul-23

MURRAY RIX

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

UKAS TESTING 1580

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

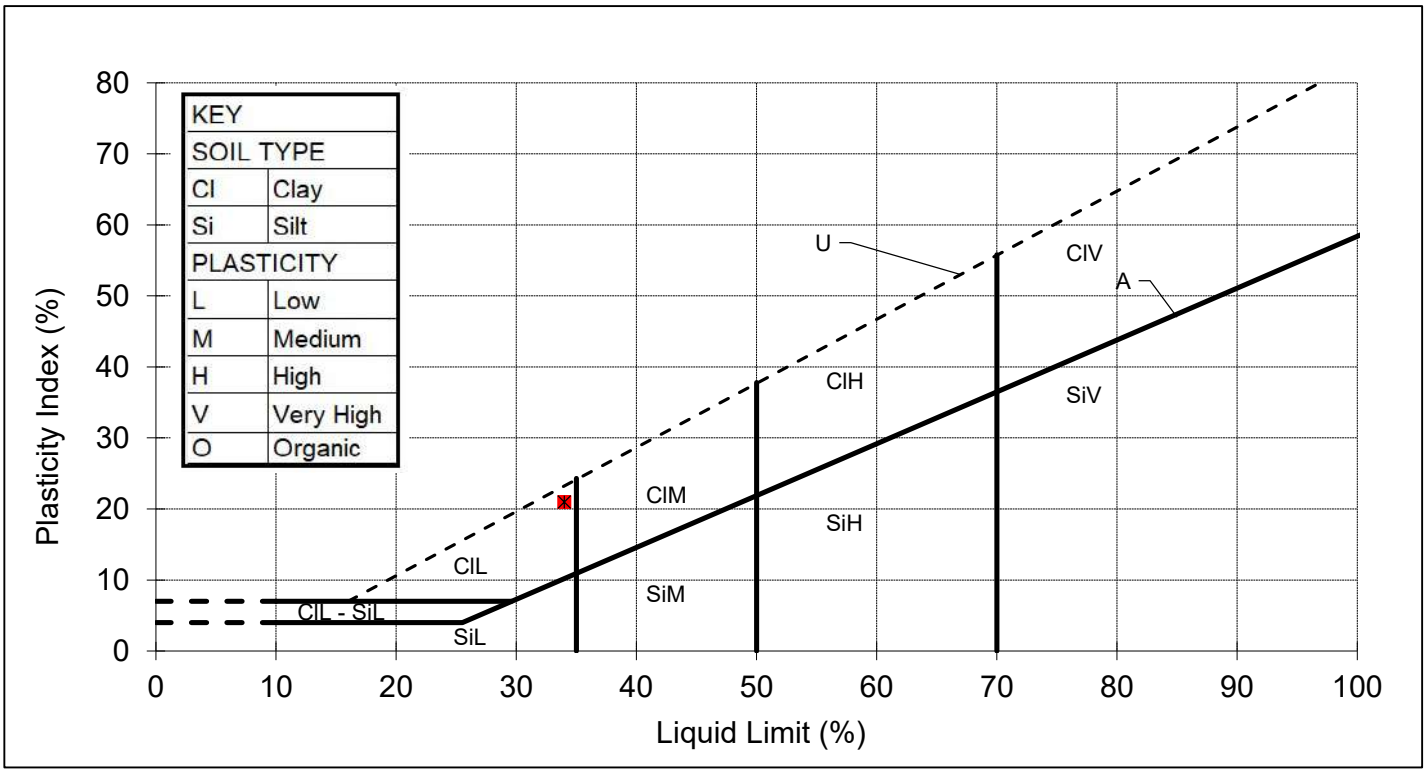
CLIENT	GRM Development Solutions Ltd
SITE	Workhouse Lane, Burbage
JOB NUMBER	MRN 4650/55

SAMPLE LABEL	WS08 1.5-1.6m	DATE SAMPLED	29-Jun-23
SAMPLE No.	128116	DATE RECEIVED	05-Jul-23
DATE TESTED	07-Jul-23	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)	18.6	32.8	1.031	
Determination 2 (avg)	18.5	32.5		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
25.3	34	13	21	96



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 12-Jul-23

MURRAY RIX

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

UKAS TESTING 1580

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

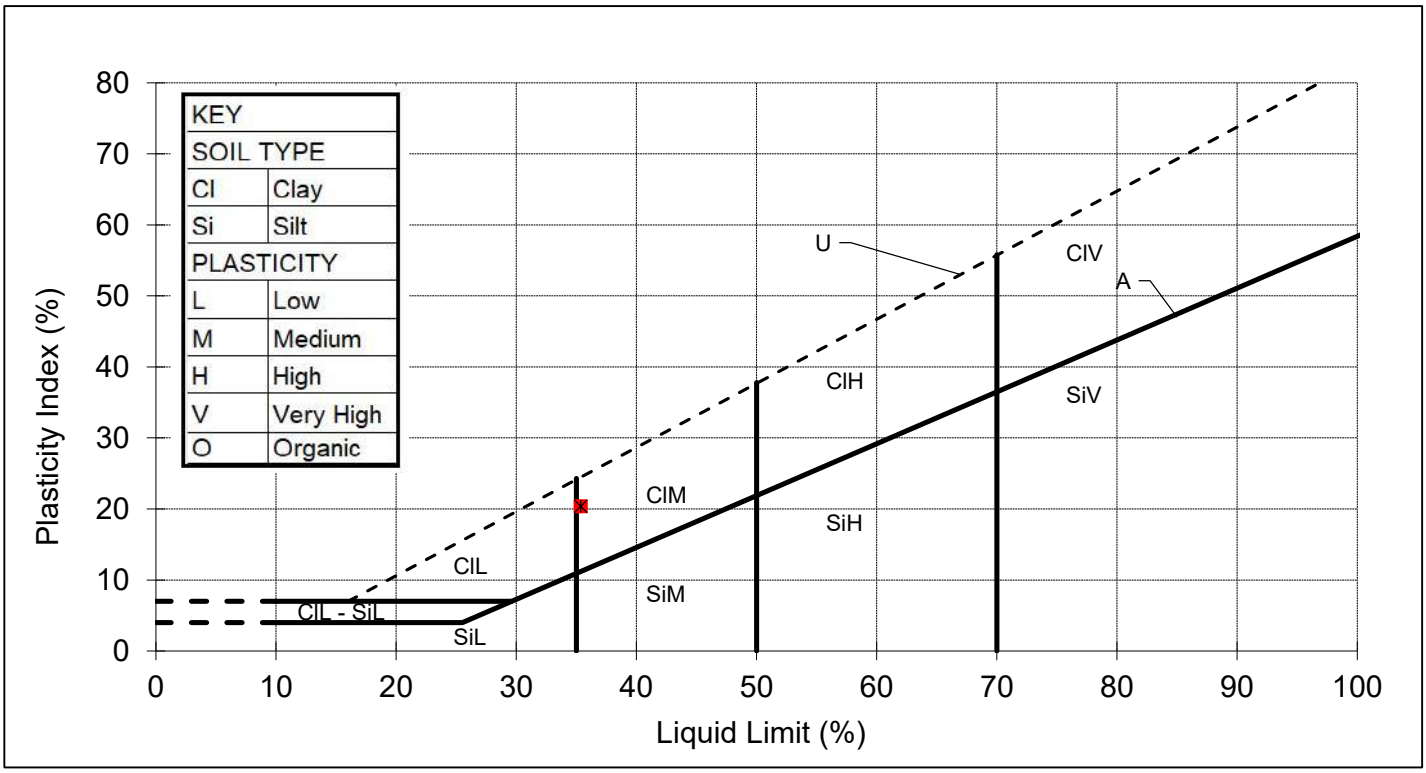
CLIENT	GRM Development Solutions Ltd
SITE	Workhouse Lane, Burbage
JOB NUMBER	MRN 4650/55

SAMPLE LABEL	WS01 1.5-1.6m	DATE SAMPLED	29-Jun-23
SAMPLE No.	128117	DATE RECEIVED	05-Jul-23
DATE TESTED	07-Jul-23	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)	17.8	34.1	1.031	
Determination 2 (avg)	18.0	34.5		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
21.3	35	15	20	90



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 12-Jul-23

APPENDIX H

	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] *o* - xylene	60	140	330
[b] *m* - xylene	59	140	320
[b] *p* - 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

APPENDIX I



NOTES:	CLIENT: MATHER JAMIE	PROJECT P9013	DATE AUG 2023	DESIGN/ DRAWN JB
	PROJECT: LAND OFF WORKHOUSE LANE, BURBAGE, HINCKLEY	DRAWING 005	ISSUE: DRAFT	
	TITLE: POST GI HAZARD PLAN			

© GRM Development Solutions Ltd © Crown Copyright. AL 100014100

GRM Development Solutions Ltd
Tel: 01283 551 249
mail@grm-uk.com www.grm-uk.com