

JNP GROUP
CONSULTING ENGINEERS

Phase II Geo-environmental Report

Project: BK UK Barnsley
Wombwell Lane,
Barnsley,
S70 3NS

Client: Burger King UK

Reference: M44628-JNP-XX-XX-RP-G-1002 P02

Date: October 2024

DOCUMENT CONTROL SHEET

L Schofield

Prepared by.....
Leona Schofield
Graduate Geo-Environmental Engineer

Joel Prestwich

Checked by.....
Joel Prestwich
Senior Geotechnical Engineer

Hilary Ilesley



Approved by.....
Hilary Ilesley BSc (Jnt Hons) MSc CBiol MSB SQP SiLC QP
Associate Geo-environmental Scientist

FOR AND ON BEHALF OF JNP GROUP

Date: 1 November 2024

Document Issue Record

Rev	Date	Description	Prepared	Checked	Approved
P01	11/09/24	First Issue	LS	JP	HI
P02	31/10/24	Updated after completion of monitoring period	LS	JP	HI

This document is for the sole use and reliance of JNP Group's Client and has been prepared in accordance with the scope of the appointment of JNP Group and is subject to the terms of that appointment.

JNP Group accepts no liability for any use of this document other than by its Client and only for the purposes for which it has been prepared.

No person other than the Client may copy (in whole or in part) or use the contents of this document, without the prior written permission of JNP Group.

Any advice, opinions or recommendations within this document should be read and relied upon only in the context of this document as a whole.

Any comments given within this document are based on the understanding that the proposed works to be undertaken will be as described in the introduction. The information referred to and provided by others and will be assumed to be correct and will not have been checked by JNP Group, JNP Group will not accept any liability or responsibility for any inaccuracy in such information.

Any deviation from the recommendations or conclusions contained in this document should be referred to JNP Group in writing for comment and JNP Group reserve the right to reconsider their recommendations and conclusions contained within. JNP Group will not accept any liability or responsibility for any changes or deviations from the recommendations noted in this document without prior consultation and our full approval.

Contents

EXECUTIVE SUMMARY	1
1 INTRODUCTION	2
1.1 GENERAL	2
1.2 OBJECTIVES	2
1.3 METHODOLOGY	2
2 SITE DESCRIPTION	3
3 SITE WORK AND MONITORING	4
3.1 INTRODUCTION	4
3.2 DYNAMIC SAMPLING BOREHOLES	5
3.3 MONITORING	5
4 LABORATORY TESTING	7
4.1 GEOTECHNICAL	7
4.2 ENVIRONMENTAL	7
5 GROUND AND GROUNDWATER CONDITIONS	8
5.1 STRATA ENCOUNTERED	8
5.2 MADE GROUND	8
5.3 ALLUVIUM	8
5.4 PENNINE MIDDLE COAL MEASURES	9
5.5 GROUNDWATER	9
5.6 GROUND GAS CONDITIONS	10
5.7 OBSTRUCTIONS	10
6 HUMAN HEALTH DETAILED QUANTITATIVE RISK ASSESSMENT	11
6.1 INTRODUCTION	11
6.2 CURRENT UK SCREENING VALUES	11
6.3 PETROLEUM HYDROCARBONS	12
7 SOIL AND GROUNDWATER ASSESSMENT RESULTS	14
7.1 SOIL RESULTS	14
7.2 LEACHATE RESULTS AND ASSESSMENT	15
7.3 SUMMARY	16
8 GROUND GAS ASSESSMENT	17
8.1 METHODOLOGY	17
8.2 RESULTS AND ASSESSMENT	17
9 REVISED CONCEPTUAL SITE MODEL AND OVERALL ENVIRONMENTAL RISK	19
9.1 SUMMARY	19
10 GEOTECHNICAL ENGINEERING ASSESSMENT	20
10.1 PROPOSED DEVELOPMENT / REDEVELOPMENT	20
10.2 SUMMARY OF GROUND AND GROUNDWATER CONDITIONS	20

10.3	SHALLOW FOUNDATIONS	20
10.4	GROUND FLOOR SLABS.....	20
10.5	GROUNDWATER AND EXCAVATIONS	21
10.6	PAVEMENT DESIGN.....	21
10.7	GROUND AGGRESSIVITY TO BURIED CONCRETE	22
11	CONCLUSIONS AND RECOMMENDATIONS	23
11.1	CONCLUSIONS.....	23
11.2	RECOMMENDATIONS.....	23
12	REFERENCES	24
	FIGURES / DRAWINGS	27
APPENDIX A:	LIMITATIONS.....	28
APPENDIX B:	THIRD PARTY DRAWINGS	
APPENDIX C:	PHOTO DOCUMENT	
APPENDIX D:	EXPLORATORY HOLE RECORDS	
APPENDIX E:	MONITORING RESULTS	
APPENDIX F:	GEOTECHNICAL RESULTS	
APPENDIX G:	CHEMICAL TEST RESULTS	

EXECUTIVE SUMMARY

Site location	Wombwell Lane, Barnsley, S70 3NS	
Development scheme	The conversion of an existing restaurant unit to a drive through Burger King restaurant.	
NGR	SE 375 052.	
Current use	On-site: Car Park.	Off-site: Commercial, retail and sports facilities, residential and road infrastructure.
Geology	Alluvium Deposits Pennine Middle Coal Measure Formation	
Geology (from GI)	Made ground deposits to 0.90m bgl - 1.00m bgl. Alluvium to 1.80m bgl - 2.60m bgl. Pennine Middle Coal Measures Formation to depths of 3.00m bgl.	
Groundwater	No groundwater was encountered during the site works but was encountered during the monitoring period at depths of 0.69 m bgl - 2.00 m bgl.	
Foundation design	Traditional shallow strip or pad foundations are considered to be suitable, founding in the natural ground. Design Sulphate Class of DS3 , with an ACEC of AC-3 , would apply for all buried concrete.	
Contamination	No Risk to human health or controlled waters as no contaminants identified above screening values. Watching brief recommended during site clearance works for unanticipated areas of contamination.	
Ground gas	A carbon dioxide monitor is required to be installed into the proposed building. No radon protection measures required.	

1 INTRODUCTION

1.1 General

1.1.1 JNP Group was instructed by Burger King UK to undertake a Ground Investigation of:

Wombwell Lane,
Barnsley,
S70 3NS

hereinafter referred to as 'the site'. This report is subject to the limitations presented in **Appendix A**.

1.1.2 It is understood that the site is to be redeveloped for a drive through restaurant with a car park.

1.1.3 The proposed redevelopment layout is shown on external Drawing Reference 2763-URB-BA-XX-DR-A-208151. Rev P00b (April 2024) produced by URBANEDGE (**Appendix B**).

1.1.4 All comments given are based on the understanding that the proposed redevelopment will be as detailed above.

1.2 Objectives

1.2.1 The purpose of the investigation was to determine the geotechnical and geo-environmental ground conditions at the site and assess the implications of such relative to the proposed commercial redevelopment. The scope of work comprised of an intrusive investigation, laboratory testing, and gas and groundwater level monitoring. This report contains details of the site, the work and laboratory testing undertaken, strata encountered, geotechnical and chemical laboratory test results, monitoring results, and provides an interpretative assessment of the ground conditions with regard to geotechnical and contaminated land issues.

1.3 Methodology

1.3.1 This report has been compiled in accordance with the on-line Land contamination: risk management (LCRM) guidance produced by the Environment Agency (June 2019). This can be found on the UK government website: <https://www.gov.uk/guidance/land-contamination-how-to-manage-the-risks>.

1.3.2 With regard to geotechnical aspects, reference is also made to the requirements of BS EN 1997, Eurocode 7, Geotechnical Design, and associated standards.

1.3.3 This report should be read in conjunction with the following JNP Group Reports:

- M44628-JNP-XX-XX-RP-G-1001 P01 Phase I Geo-environmental Report
- M44628-JNP-XX-XX-RP-C-1001 Drainage Strategy Statement

2 SITE DESCRIPTION

- 2.1.1 The site is located off Wombwell Lane, in Stairfoot approximately 3.1 miles from Barnsley town centre (see Figure 1 Key Plan). The centre of the site is located at National Grid Reference SE 375 052. The site covers an area of approximately 0.21 hectares.
- 2.1.2 The site comprises of a car park with several lights and closed circuit tv cameras sporadically distributed across the site. There are several of manholes, predominantly in the north-west of the site. There is a drainage run to the south-east corner of the site. The northern and western boundaries of the site comprise of car parking spaces with a path around the perimeter. The eastern boundary of the site comprises of car parking spaces with a slope from the adjacent road. The southern boundary comprises of car parking spaces.
- 2.1.3 The site is relatively flat at approximately 49 m aOD.
- 2.1.4 The ground consists of hardstanding and is generally in good condition.
- 2.1.5 A selection of photographs taken during the site walkover are included as Appendix C.
- 2.1.6 The surrounding land to the north comprises a slope (~1 m high), sloping to the south, from Wombwell Lane, and a heritage park approximately 30 m from the site comprising public footpaths and green spaces. There is an electricity substation present adjacent to the northern boundary of the site. There are two BT manhole covers adjacent to the north-east corner and the south-west corner of the site. The land to the east consists of a road which is around 0.50 m higher than the site with a fuel station approximately 20 m from the site, and retail outlets. The surrounding area to the south consists of a superstore. There are residential properties, sports facility and warehouses located between 10 and 400 m to the west of the site. There are several car servicing trades to the north-west of the site.
- 2.1.7 The surrounding land uses are summarised in Table 2.1 below.

Table 2.1 Surrounding Land Use

Direction	Land Use
North	Road and heritage site comprising of public footpaths and greenspaces.
East	Fuel station and retail outlets.
South	A car park and a superstore.
West	Residential properties, sports facility, garages and warehouses.

3

3 SITE WORK AND MONITORING

3.1 Introduction

- 3.1.1 The intrusive site work was undertaken by JNP Group on 29th July 2024 and comprised five dynamic sampling boreholes. Six return gas and groundwater level monitoring visits will be undertaken during a period from 05th August until the 18th October 2024 following the completion of the site works.
- 3.1.2 All site work was completed under the instruction and supervision of JNP Group with the ground investigation procedures and sample descriptions given in the following publications:
- BS 5930 (2015). Code of Practice for Site Investigations;
 - BS 10175 (2001+A1:2013+A2:2017). Investigation of potentially contaminated sites - code of practice;
 - BS EN ISO 14688-1. "Soil - Identification and Description;
 - BS EN ISO 14688-2. Soil - Classification principles and quantification of descriptive characteristics;
 - BS EN ISO 14689. Rock - Identification and description;
 - BS 18400-104:2018. Soil Quality – Sampling. Part 104: Strategies;
 - BS 18400-202:2018. Soil Quality – Sampling. Part 202: Preliminary Investigations;
 - BS 18400-203: 2018. Soil Quality – Sampling. Part 203: Investigation of potentially contaminated sites;
 - BS 18400-205: 2018. Soil Quality – Sampling. Part 205: Guidance on the procedure for investigation of natural, near natural and cultivated sites;
- 3.1.3 For sites affected by asbestos impacted soils, the guidance given in the following publications has been followed:
- Industry Guidance on Interpretation for Managing & Working with Asbestos in Soil and Construction and Demolition Materials (CL:AIRE 2016);
 - Asbestos in Soil and made ground: a guide to understanding and managing risks (CIRIA C733 2014).
- 3.1.4 The design and installation of groundwater quality monitoring points has been undertaken following the guidance given in the Environment Agency science report:
- SC020093. Guidance on the design and installation of groundwater quality monitoring points. 2006.
- 3.1.5 The scope of the intrusive works was agreed with the client BKUK.
- 3.1.6 The locations of the exploratory holes are shown on JNP Group Drawing No.M44628-JNP-XX-XX-RP-G-0001. Desk Study. The exploratory hole records including strata and groundwater encountered, in-situ testing and samples taken are presented in **Appendix D**. The full details of the site work undertaken are summarised in the following sections.
- 3.1.7 The purpose of the intrusive sitework was to obtain data to support a planning application for the construction of a Burger King Restaurant.

- 3.1.8 The site investigation strategy comprised a general coverage of the site to obtain information for both geotechnical and geo environmental analysis.

Table 3.1 Exploratory Hole Location Rationale

Exploratory Hole Reference	Rationale
WS01	To obtain general site information.
WS02	To obtain general site information.
WS03	To obtain general site information.
WS04	To obtain general site information.
WS05	To obtain general site information.

- 3.1.9 The general sampling strategy was to take representative soil samples from the ground to characterise the strata encountered and to provide suitable horizontal distribution.

3.2 Dynamic Sampling Boreholes

- 3.2.1 Five dynamic sampling boreholes, designated WS01 – WS05 (inclusive) were formed on 29th July 2024, to depths of 3.00m below ground level (bgl) at various locations across the site.

- 3.2.2 The dynamic sampling technique uses a lightweight tracked rig to advance a borehole by 1 m intervals using 1 m long steel sampler tubes, at diameters of 100 mm, reducing to 70 mm. The soils are then recovered from each sample tube as continuous core samples, which are logged and sub-sampled on site. Environmental soil samples were generally taken from each made ground material, together with any materials suspected of containing elevated concentrations of contaminants, based on visual and olfactory evidence. The environmental samples comprised a small volatiles jar, and an amber glass jar. Bulk and small plastic tub samples were also taken from selected materials, for laboratory geotechnical testing. In situ Standard Penetration Tests (SPTs) were undertaken in accordance with BS 5930 (2015) at 1.0 m depth intervals in the boreholes in order to obtain in situ strength or relative density parameters for geotechnical design.

- 3.2.3 Four boreholes (WS01, WS02, WS03, WS04) were completed with 50 mm gas and groundwater monitoring standpipe installations, with flush fitting steel covers set in concrete at ground level. The remaining boreholes were backfilled with arisings and the ground surface left in a safe and tidy manner.

- 3.2.4 Response zones within the installations in WS01, WS03 and WS04 were installed between depths of 1.00 m bgl to 3.00 m bgl in order to target the underlying Alluvium and Pennine Middle Coal Measures. WS02 was installed with a response zone of 0.50m bgl to 1.50m bgl to target the made ground deposits.

3.3 Monitoring

- 3.3.1 Monitoring of the installed standpipes was undertaken every two weeks over three months. Monitoring involved the measurement of the ground gas composition at each of the installations for methane (CH₄), carbon dioxide (CO₂) and oxygen (O₂) concentrations, together with atmospheric pressure, downhole pressure and flow rates, using a Gas Data GFM430 gas meter. After the measurement of gas concentrations, the depth to any

groundwater within the standpipe was recorded. At least two of the monitoring visits will be undertaken during periods of low and falling atmospheric pressure.

3.3.2 The frequency and duration of gas monitoring was selected based on the guidance given in the following publications:

- CIRIA C665. Assessing risks posed by hazardous gases to buildings. 2007;
- BS 8485. Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings. 2015;
- CL:AIRE RB 17. A Pragmatic Approach to Ground Gas Risk Assessment. 2012.

3.3.3 The monitoring frequency for this site was for six visits over a period of three months.

3.3.4 Groundwater monitoring was undertaken alongside the gas monitoring visits, The following table justifies the response zones selected for each monitoring borehole.

Table 3.2 Response Zone Rationale

Exploratory Hole Reference	Response Zone (m bgl)	Rationale
WS01	1.00 – 3.00	To monitor groundwater concentrations and levels within the Alluvium and Pennine Middle Coal Measures.
WS02	0.50 – 1.50	To monitor groundwater concentrations and levels within the made ground deposits and Alluvium.
WS03	1.00 – 3.00	To monitor groundwater concentrations and levels within the Alluvium and Pennine Middle Coal Measures.
WS04	1.00 – 3.00	To monitor groundwater concentrations and levels within the Alluvium and Pennine Middle Coal Measures.

3.3.5 It should be noted that long-term groundwater levels may vary from those reported due to seasonal fluctuation or weather events, such as droughts, significant rainfall, or recent flooding.

3.3.6 The monitoring results are presented in **Appendix E**.

3.3.7 It should be noted that once the groundwater monitoring boreholes are no longer required they need to be decommissioned following the guidance given in the EA science report SC020093 (EA 2008).

4 LABORATORY TESTING

4.1 Geotechnical

4.1.1 A programme of laboratory testing was scheduled by JNP Group to determine geotechnical properties of selected soil samples obtained from the investigation. The details of the geotechnical testing are summarised below:

Table 4.1 Scheduled Geotechnical Laboratory Tests

Test Description	Number of Tests
Atterberg limits including moisture content	4
Ground Aggressivity Suite (in accordance with BRE SD1)	4

4.1.2 Tests were undertaken in accordance with BS1377 (1990) "Methods of test for Soils for Civil Engineering purposes". The results of the geotechnical testing are presented in **Appendix F**.

4.2 Environmental

4.2.1 A programme of chemical laboratory testing was scheduled by JNP Group on selected soil samples taken from various depths in the made ground and natural ground recovered from the exploratory holes. Samples of any soils displaying visual or olfactory evidence of contamination were also collected and submitted for laboratory analyses. The samples were placed into suitable containers for the required chemical analyses.

4.2.2 All samples were transported, on the day of collection, to i2 Analytical Testing Services is accredited under UKAS and MCerts. The following table summarises the contaminants scheduled:

Table 4.2 Scheduled Soil Chemical Analyses

Determinant	No
Metals and semi-metals (arsenic, beryllium, boron, cadmium, chromium, copper, lead, mercury, nickel, selenium, vanadium and zinc)	7
Polycyclic Aromatic Hydrocarbons (PAH) 16 USEPA Speciated	7
Total Petroleum Hydrocarbons (TPH) Carbon banded	2
TPH Criteria Working Group (TPH CWG)	3
pH	6
Asbestos screening	6
Total Organic Carbon	6
Leachate for metals and semi-metals (arsenic, beryllium, boron, cadmium, chromium, copper, lead, mercury, nickel, selenium, vanadium and zinc)	3
pH, DOC, Ca, Hardness	1

5 GROUND AND GROUNDWATER CONDITIONS

5.1 Strata Encountered

5.1.1 The ground conditions encountered during the intrusive investigation were generally consistent with the published geological map. A variable thickness of made ground was found to be underlain by cohesive Alluvium deposits which in turn was underlain by Pennine Middle Coal Measures Formation, this graded from stiff clay to a weathered mudstone with increasing depth.

5.1.2 A summary of the stratigraphy encountered during the investigation is presented in the following table and described in the following sections, but for full details and descriptions, reference should be made to the exploratory hole records presented in **Appendix D**.

Table 5.1 Stratigraphy Encountered

Stratum	Depth to Top (m bgl)	Depth to Base (m bgl)	Thickness (m)
Made ground (including hardstanding) All exploratory holes	Ground level	0.90 - 1.00	0.90 - 1.00
Alluvium All exploratory holes	0.90 – 2.60	1.80 – 2.60	1.00 – 1.60
Pennine Middle Coal Measures All exploratory holes	1.80 – 2.50	Not proven	Not proven

5.2 Made Ground

5.2.1 Asphalt hardstanding was encountered in all exploratory hole locations. Cream gravel sub-base was encountered beneath the hardstanding at all exploratory hole locations.

5.2.2 Made ground was encountered below the hardstanding to depths of 0.90 – 1.00 m bgl.

5.2.3 The made ground consisted of creamy gravelly sub-base, black gravelly sub-base including tarmac, red brick and sandstone.

5.3 Alluvium

5.3.1 Soils inferred to be Alluvium were encountered in all exploratory holes. The top of the lithological unit was encountered at depths of between 0.90 m to 2.60 m bgl, extending to depths of between 1.80 m and 2.60 m bgl, with a maximum thickness of 1.60 m encountered in WS01.

5.3.2 The Alluvium consisted of stiff to firm grey-orange mottled clay.

Table 5.2 Alluvium – Geotechnical Laboratory Test Results Summary

Property	Number of Tests	Range	Mean	Assessment
Natural Moisture Content	3	19 – 35.6	27.7	Medium to High volume change potential. Very high to extremely high plasticity clays.
% passing 425 sieve	3	92 - 100	97.3	
Liquid Limit %	3	41 - 64	54.3	
Plastic Limit %	3	22 - 29	24.7	
Plasticity Index %	3	19 - 35	30	

Property	Number of Tests	Range	Mean	Assessment
Modified Plasticity Index %	3	19 -35	29	
SPT 'N' Values (cohesive)	7	6 - 26	12	Soft to stiff
$c_u = 4.5 \times \text{SPT 'N' Value (kN/m}^2\text{)}$	7	27 - 117	55	Soft to very stiff

5.3.3 The SPT N value / depth profile is presented as Figure 2, the undrained shear strength / depth profile as Figure 3, and a plasticity chart as Figure 4, the moisture content/ depth relationship as Figure 5.

5.4 Pennine Middle Coal Measures

5.4.1 Strata of the Pennine Middle Coal Measures were encountered in all of the exploratory holes. The depth to the top of the Pennine Middle Coal Measures varied from 1.80 – 2.50 m bgl. The base of the lithology was not proven, with the maximum depth penetrated, 3.00 m bgl in all exploratory holes.

5.4.2 The lithological unit was found to comprise orange, brown weak weathered mudstone.

Table 5.3 Pennine Middle Coal Measures– Geotechnical Laboratory Test Results Summary

Property	Number of Tests	Range	Mean	Assessment
Natural Moisture Content	1	16.4	16.4	Medium volume change potential. Very high plasticity clays.
% passing 425 sieve	1	100	100	
Liquid Limit %	1	35	35	
Plastic Limit %	1	16	16	
Plasticity Index %	1	19	19	
Modified Plasticity Index %	1	16	16	
SPT 'N' Values (cohesive rock)	8	17 - 100	71	Extremely weak
$c_u = 4.5 \times \text{SPT 'N' Value (kN/m}^2\text{)}$	3	77 - 117	96.3	High Strength

5.4.3 The SPT N value / depth profile is presented as Figure 2, and a plasticity chart is presented as Figure 4.

5.5 Groundwater

5.5.1 Details of groundwater entries recorded during the site work period, and levels recorded subsequently during the monitoring visits, are summarised in the table which follows.

Table 5.4 Summary of groundwater observations

Exploratory Location	Groundwater during site work		Groundwater during monitoring
	Strikes (m bgl)	Comments	Range
WS01	-		1.26 – 1.78
WS02	-		0.69 – 0.75
WS03	-		1.54 – 2.89

Exploratory Location	Groundwater during site work		Groundwater during monitoring
	Strikes (m bgl)	Comments	Range
WS04	-		1.47 – 2.20

5.5.2 Groundwater was encountered during the monitoring period at depths of 0.69 m bgl to 2.20 m bgl. As the site is fairly flat, this would suggest perched groundwater in more granular strata and / or made ground rather than a permanent water table across the site.

5.6 Ground Gas Conditions

5.6.1 During the monitoring visits, methane concentrations remained below detection limits, and a maximum concentration of carbon dioxide of 12.2 % was recorded, with the highest flow rates recorded as 5.60 l/hr. Full details of the gas concentrations and flow rates recorded during the monitoring period are presented in **Appendix E**.

5.7 Obstructions

5.7.1 All boreholes were terminated due to refusal at 3.00 m bgl on bedrock of the Pennine Middle Coal Measures.

6 HUMAN HEALTH DETAILED QUANTITATIVE RISK ASSESSMENT

6.1 Introduction

6.1.1 Qualitative assessment of risks may be sufficient in many cases to eliminate the possibility of significant pollutant linkages. However, quantitative risk assessment is formally required to determine whether there is a 'significant possibility of significant harm being caused'. Part IIA of the Environmental Protection Act 1990 recommends that 'authoritative and scientifically based guideline values for concentrations of the potential pollutants in or under the land' be used to quantify the risk posed by contamination.

6.1.2 Under the Planning Regime, a quantitative risk assessment can be used to decide whether the site is suitable for the proposed use. In addition, the National Planning Policy Framework (March 2012) also indicates that after remediation, as a minimum land should not be capable of being determined as contaminated land under Part IIA.

6.2 Current UK Screening Values

6.2.1 The UK technical guidance for assessing risks to human health is issued from various UK bodies, including the Environment Agency (EA), DEFRA, Contaminated Land: Applications in Real Environment (CL:AIRE), Chartered Institute of Environmental Health (CIEH), and Land Quality Management (LQM) Ltd (part of the University of Nottingham).

6.2.2 New and updated screening values in the form of provisional Category 4 Screening Levels (C4SL) (published in 2014), and Suitable for Use Levels (S4UL), (published 2015), have been produced by DEFRA and CIEH / LQM respectively using modified versions of the EA's Contaminated Land Exposure Assessment (CLEA) software.

C4SL

6.2.3 Provisional C4SL have been derived by CL:AIRE (project team for DEFRA's SP1010 project) following revised statutory guidance, and as a tool to assist in applying the Part IIA Category 1- 4 classifications to a site. The purpose of the C4SL is to provide a simple test for deciding that land is suitable for use, and definitely not contaminated land under Part IIA. They describe a level of risk that is above minimal, but is still low.

6.2.4 In calculating provisional C4SL some of the exposure modelling scenarios and exposure parameters used in the CLEA software have been modified. These modifications are not discussed further, but reference should be made to the original CL:AIRE / DEFRA publications should further information or clarification be required. A list of the new publications is included in the references section at the end of this report.

6.2.5 To date, fourteen contaminants have been assigned provisional C4SL including arsenic; benzene; benzo[a]pyrene; cadmium; chromium VI, lead, mercury, naphthalene, and some chlorinated solvents for the standard land uses (residential with, and without plant uptake, allotments, commercial, and public open space (parks and residential).

6.2.6 The C4SL are also considered suitable to be used under the planning regime, and DEFRA have confirmed this to all local authorities.

S4UL

6.2.7 The LQM / CIEH S4UL represent generic assessment criteria based on minimal or tolerable risk that are intended to be protective of human health. They have been derived in

accordance with current UK legislation using a modified version of the CLEA software, and are still based on many conservative assumptions. They represent values above which further assessment of the risks or remedial actions may be needed.

- 6.2.8 S4UL have been derived for a comprehensive list of metals, non–metals, petroleum hydrocarbons, polycyclic aromatic hydrocarbons, chlorinated hydrocarbons, phenolic compounds, explosives, and pesticides, for the standard land uses (residential with, and without plant uptake, allotments, commercial, and public open space (residential and park)).
- 6.2.9 For details of the exposure parameters and scenarios used to derive the S4UL the reader is reference to the original LQM / CIEH document “The LQM/CIEH S4UL for Human Health Risk Assessment” (2015).
- 6.2.10 Both sets of screening values can be used to undertake a generic risk assessment by comparing the data directly to the screening value which is considered a conservative approach or statistically to the screening value. Alternatively and if a sufficient dataset is available, a statistical assessment can be undertaken following the guidance given in the joint Chartered Institute of Environmental Health (CIEH) and the Contaminated Land: Applications in Real Environment (CL:AIRE) organisation publication “Guidance On Comparing Soil Contamination Data with a Critical Concentration” (CIEH / CL:AIRE May 2008).

6.3 Petroleum Hydrocarbons

- 6.3.1 JNP Group have followed the guidance given in the Environment Agency publication ‘The UK Approach for Evaluating Human Health Risks from Petroleum Hydrocarbons in Soils’ (Environment Agency, 2005). LQM S4UL values have been published based on carbon banded hydrocarbons with aliphatic and aromatic split, corresponding to the TPH CWG bands. JNP Group undertook carbon banded analysis using wider bands than used by TPH CWG without aliphatic and aromatic split.
- 6.3.2 JNP Group have compared the results of carbon-banded hydrocarbon analysis with the most sensitive LQM S4UL value within the band under scrutiny. Generally, the most sensitive band comprises the lightest aromatic fraction within the carbon band under scrutiny.
- 6.3.3 The Society of Brownfield Risk Assessment (SoBRA) have produced some Generic Assessment Criteria for assessing chronic risks from the inhalation of vapours arising from groundwater (GAC_{gwwap}) for a short list of 66 organic contaminants (SoBRA February 2017). These are designed to a defensible screening criteria to assist in evaluating this exposure pathway. They represent concentrations below which the chronic risks from vapour migration and inhalation can be considered low / tolerable. GAC_{gwwap} have been developed in line with current UK risk assessment guidance, and CLEA v1.07 software was used for residential and commercial land use scenarios.
- 6.3.4 Further details of the input parameters selected for use to generate the GAC_{gwwap} can be found in the SoBRA report, and have not been reproduced here. However, it should be noted that they have been derived using some conservative assumptions:
- Impacted ground / perched water is beneath the buildings;
 - An infinite source term is present;
 - There is no biodegradation;
 - Groundwater depth is 0.65m below ground;

- Use of a sand soil type (in line with SR3).

7 SOIL AND GROUNDWATER ASSESSMENT RESULTS

7.1 Soil Results

7.1.1 The results of chemical testing of seven samples of made ground and three 1 sample of natural soils have been compared with the C4SL and the LQM S4UL values for a 'Commercial use no plant uptake'. These comparisons are summarised in the following tables.

7.1.2 The following determinants were recorded at concentrations less than their respective limits of laboratory detection, and hence have not been included in this assessment: asbestos, , acenaphthylene, acenaphthene, fluorene, dibenzo(a,h)anthracene, –aliphatic petroleum hydrocarbons >EC5 - EC35, and BTEX.

Table 7.1 Comparison of Soil Chemical Test Results with Commercial Guideline Values

Determinant	Maximum Measured Concentration (mg/kg) Made Ground	Maximum Measured Concentration (mg/kg) Natural	Background Concentration (mg/kg)	LQM/CIEH Commercial (mg/kg)			No. of tests	No. of exceedances
				1%	2.5%	6%		
Arsenic	18	13	15 – 25	640			6 MG/1 N	0
Beryllium	3.7	1.2	-	12			6 MG/1 N	0
Boron	0.6	100	-	290			6 MG/1 N	0
Cadmium	0.4	-	0.32 – 1.8	190			6 MG/1 N	0
Chromium (total or trivalent)*	34	39	60 – 90	8600			6 MG/1 N	0
Copper	86	31	28	68000			6 MG/1 N	0
Mercury	0.3	-	-	320			6 MG/1 N	0
Lead	32	17	75 - 200	2330**			6 MG/1 N	0
Nickel	30	32	21 - 45	980			6 MG/1 N	0
Selenium	2.1	-	-	12000			6 MG/1 N	0
Vanadium	58	39	70	9000			6 MG/1 N	0
Zinc	90	62	88	40000			6 MG/1 N	0
					1%	2.5%	6%	
Naphthalene	0.08	At limit of detection	-	190	460	1100	6 MG/1 N	0
Phenanthrene	0.72	At limit of detection	-	22000	22000	23000	6 MG/1 N	0
Anthracene	0.18	At limit of detection	-	520000	540000	540000	6 MG/1 N	0
Fluoranthene	0.90	At limit of detection	-	23000	23000	23000	6 MG/1 N	0
Pyrene	0.83	At limit of detection	-	54000	54000	54000	6 MG/1 N	0
Benzo(a)anthracene	0.52	At limit of detection	-	170	170	180	6 MG/1 N	0
Chrysene	0.51	At limit of detection	-	350	350	350	6 MG/1 N	0
Benzo(b)fluoranthene	0.75	At limit of detection	-	44	44	45	6 MG/1 N	0
Benzo(k)fluoranthene	0.26	At limit of detection	-	1200	1200	1200	6 MG/1 N	0
Benzo(a)pyrene	0.56	At limit of detection	-	35	35	36	6 MG/1 N	0
Indeno(1,2,3-	0.35	At limit of	-	500	510	510	6 MG/1 N	0

Determinant	Maximum Measured Concentration (mg/kg) Made Ground	Maximum Measured Concentration (mg/kg) Natural	Background Concentration (mg/kg)	LQM/CIEH Commercial (mg/kg)			No. of tests	No. of exceedances
c,d)pyrene		detection						
Benzo(g,h,i)perylene	0.41	At limit of detection	-	3900	4000	4000	6 MG/ 1 N	0
TPH C ₂₅ -C ₄₀ (TPH aromatic C ₂₁ -C ₃₅ ***)	120	At limit of detection	-	28000			6 MG/ 1 N	0

* assumed all chromium on site is in trivalent form

** provisional C4SL

*** Most sensitive fraction within wider TPH band (specified)

7.1.3 There are no elevated concentrations of heavy metals or hydrocarbons in any of the samples submitted to laboratory testing from both the made ground deposits and the natural soils encountered on site.

7.1.4 Six samples were submitted for an asbestos screen within the made ground deposits, with no traces detected during the laboratory testing.

7.2 Leachate Results and Assessment

7.2.1 A total of three samples of made ground were submitted for leachate analysis in order to determine metal mobility.

7.2.2 The following determinants were recorded at concentrations less than the limit of laboratory detection and hence, have not been included in this assessment: mercury, selenium.

Table 7.2 Comparison of Leachate Chemical Test Results with Guideline Values

Determinant	Maximum Measured Concentration (µg/l)	Drinking Water Standard (µg/l)	Freshwater Environmental Quality Standard (µg/l)	No. of tests undertaken	No. of exceedances
Arsenic	3.9	10	50	3	0
Barium	47	100	n/a	3	0
Boron	95	1000	2000	3	0
Cadmium	0.16	5	5	3	0
Chromium (total)	2.6	50	5-50*	3	0
Copper	9.09**	2000	1**	3	3 for the EQS in WS01 @0.45m bgl WS02 @0.50m bgl, WS03 @0.30m bgl
Lead	0.77	25	1.2**	3	0

Determinant	Maximum Measured Concentration (µg/l)	Drinking Water Standard (µg/l)	Freshwater Environmental Quality Standard (µg/l)	No. of tests undertaken	No. of exceedances
Nickel	3.5	20	4**	3	0
Vanadium	5.1	n/a	20 – 60*	3	0
Zinc	21.05**	3000	10.9**	3	3 for the EQS in WS01 @0.45m bgl, WS02 @0.50m bgl, WS03 @0.30m bgl

* Dependent on hardness, salmonid receptor

** bioavailable EQS UK TAG

7.2.3 There are no exceedances against the drinking water standard in the samples sent for laboratory testing.

7.2.4 Three exceedances (WS01 @0.45m bgl, WS02 @5.0 and WS03 @0.30m bgl) were recorded for copper and zinc when compared to the Freshwater Environmental Quality Standard indicating some mobility. Given that the made ground concentrations for these two metals were a similar order of magnitude to the natural ground and background concentrations, any mobility is considered by JNP Group to be natural and does not pose a significant risk to the controlled waters.

7.3 Summary

7.3.1 On the basis of the chemical testing undertaken, JNP Group considers that there is no present risk on site to human health or controlled waters, hence no further remediation will be required for the proposed development.

8 GROUND GAS ASSESSMENT

8.1 Methodology

8.1.1 JNP Group has used the guidance given in the following document to assess the risks from ground gases or landfill gases:

- CIRIA C665. Assessing risks posed by hazardous gases to buildings. 2007;
- BS 8485. Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings. 2015 +A1 2019;
- CL:AIRE RB 17. A Pragmatic Approach to Ground Gas Risk Assessment. 2012
- NHBC. Hazardous Ground Gas – An Essential Guide for Housebuilders. NF94. April 2023.

8.1.2 JNP Group has used multiple lines of evidence when assessing the risks from ground gases:

- Nature, type and thickness of ground encountered
- Organic content of stratum
- Review of data set (size, anomalous results)
- Location so buildings in relation to gas monitoring installations
- Initial review of maximum gas and flow concentrations against reference values prescribed within BS 8485 (2015);
- Calculation of appropriate gas screening value (GSV) to suit dataset to determine the site characteristic for the site. The GSV is calculated using the following equation, with the resulting number compared to those given in Table 2 of BS: 8584 (2015 +A1 2019)
 - $\text{gas concentration (\%)} \times \text{borehole flow rate (l/h)}$

8.2 Results and Assessment

8.2.1 The thickness of made ground deposits encountered onsite was between 0.90 – 1.00 m bgl. The made ground consisted of asphalt and sub-base over sandy clayey gravels.

8.2.2 The thickness of Alluvium varied across the boreholes from depths of 0.90 m bgl to 2.90 m bgl. The alluvium deposits consisted of brown sandy clayey gravelly sands and clays.

8.2.3 Pennine Middle Coal Measures were encountered from depths of 2.00m bgl to 3.00m bgl. The deposits consisted of sandy clays and weathered mudstones.

8.2.4 There was no visual evidence of organic matter during the site investigation.

8.2.5 A total of six total organic carbon results were obtained what ranged between 0.1 - 3.4 %, The two highest TOC results were recorded in the deeper made ground indicating this to be more organic. The shallower subbase made ground recorded lower organic content of 0.1 - 0.5%.

8.2.6 Methane concentrations above 1% were not recorded during the monitoring period.

8.2.7 Carbon dioxide concentrations above 5% were recorded on five monitoring visits at WS01 on 03/09/2024. From the monitoring undertaken to date air pressures have been similar and there have been limited fluctuations in water level. The response zone for this installation

was within the Alluvium but none of the other boreholes recorded similar results indicating it to be localised. Air pressures ranged from 1001 – 1006 mb.

- 8.2.8 Elevated flow rates above 70 l/hr were not recorded; the highest flow rate of 5.60 l/hr was recorded in WS02, on 16/09/2024.
- 8.2.9 The maximum carbon dioxide and methane concentrations, the maximum flow rate, and the screening values for each borehole during the site work periods, are summarised in the following table.
- 8.2.10 The raw and collated results of the ground gas monitoring undertaken are presented in **Appendix E**. In addition, this includes a graph showing the atmospheric pressure trend throughout the monitoring period.
- 8.2.11 Given the small dataset (6 monitoring visits) gas screening values have been calculated using maximum gas concentrations and worst-case flow rates.

Table 8.1 Calculated Gas Screening Values

Location	Maximum / Average CH ₄ Concentration (% v/v)	Maximum / Average CO ₂ Concentration (% v/v)	Maximum / Selected Flow Rate (l/hr)	GSV (l/hr)	Comments / Justification
WS01	>1.0	12.2	3.0	0.0366	CS2
WS02	>1.0	2.7	5.6	0.01512	CS1
WS03	>1.0	3.4	0.4	0.00136	CS1
WS04	>1.0	3.8	2.7	0.01026	CS1

- 8.2.12 Those values highlighted either exceed the initial assessment values or exceed the characteristic gas screening values given in Table 2 of BS: 8584 (2015 +A1 2019).
- 8.2.13 A ‘CS1’ determination was derived from the monitoring results from WS02, WS03, WS04. A ‘CS2’ determination was derived from the monitoring results from WS01, due to the elevated carbon dioxide concentrations recorded. However, given that the carbon dioxide was localised and associated with natural strata as well as the fact that the proposed building is not overlying WS01, JNP Group consider that gas protection measures are not necessary at the site providing a carbon dioxide monitor is incorporated into the building. Note this monitor would require regular checks to ensure it is functioning.

9 REVISED CONCEPTUAL SITE MODEL AND OVERALL ENVIRONMENTAL RISK

9.1 Summary

9.1.1 Following the ground investigation and subsequent assessment undertaken, the conceptual site model and overall environmental risk assessment have been updated as detailed in the following table.

Table 9.1 Updated Conceptual Model and Risk Assessment

Issue	Risk	Justification
HUMAN HEALTH	MEDIUM	No contamination found or contamination at concentrations similar to background and hence is not considered to be of significant concern Localised I concentrations of carbon dioxide have been recorded outside of the proposed building. The use of a carbon dioxide monitor inside the proposed building is recommended. acceptable to the end users.
GROUNDWATER	LOW	Contamination concentrations are similar to background. No mobile species of metals or hydrocarbons present.
SURFACE WATER	LOW	Contamination at concentrations similar to background. No mobile species of metals or hydrocarbons present.
PROPERTY & INFRASTRUCTURE	MEDIUM	Localised concentrations of carbon dioxide have been recorded outside of the proposed building. The use of a carbon dioxide monitor inside the proposed building is recommended.
ECOLOGY	NONE	Based on the assumption that there are no sensitive/ protected species on site (subject to any ecological survey undertaken)

10 GEOTECHNICAL ENGINEERING ASSESSMENT

10.1 Proposed Development / Redevelopment

10.1.1 It is proposed to redevelop the site with a Burger King restaurant and drive through on the existing carpark onsite.

10.2 Summary of Ground and Groundwater Conditions

10.2.1 The ground conditions encountered during the intrusive investigations were generally consistent with the published geological records. In general, a variable thickness of made ground was encountered across the site consisting of asphalt underlain by sub-base. The made ground was found to overlie soft to stiff Alluvium deposits. This was underlain by Pennine Middle Coal Measures Formation to depths of 3.00m, this graded from stiff clay to a weathered mudstone with increasing depth.

10.2.2 Groundwater was encountered during the monitoring period at depths of 0.69 m bgl to 2.20 m bgl. As the site is fairly flat, this would suggest perched groundwater in more granular strata and / or made ground rather than a water table across the site.

10.3 Shallow Foundations

10.3.1 The made ground deposits are considered unsuitable to support foundation loads due to their poor engineering characteristics, and inherent variability.

10.3.2 Traditional shallow strip or pad foundations are considered feasible, placed within the weathered mudstone of the Pennine Middle Coal Measures. However, trench fill foundations may be required due to the thickness of the made ground.

10.3.3 Foundation excavations should be taken through all made ground deposits, and foundations placed within the Pennine Middle Coal Measures Formation at a minimum founding depth between 1.50 m to 2.00 m bgl, based upon the thickness of the made ground and the depth to mudstone. Should competent ground be found before this then the depth is required to the weathered mudstone of the Pennine Middle Coal Measures Formation. An allowable bearing pressure of at least 125 kN/m² would be available at depths between 1.50-2.00 m bgl, based upon standard 0.60 m wide foundations within the weathered mudstone of the Pennine Middle Coal Measures. The allowable bearing capacity includes an overall factor of safety of 3 against bearing capacity failure, whilst ensuring total settlements are maintained at less than 25mm. However, there are several trees, bushes and hedges in and around the site, and the influence of these may be the controlling criteria for determining foundation type and depth.

10.3.4 Where foundations are to be constructed within the influence of existing, felled or proposed trees, they will require deepening, and heave precautions adopted in accordance with National House Building Council (NHBC) Chapter 4.2 'Building Near Trees', based upon soils of high volume change potential. JNP Group recommends that a tree species survey is undertaken, and the results are used to calculate their zones of influence, in order to define areas where foundations would require deepening.

10.4 Ground Floor Slabs

10.4.1 The underlying soils are considered to have high volume change potential, and consequently may heave. Therefore, suspended ground floor slabs should be used incorporating suitable

underfloor voids, based on the recommendations in NHBC Chapter 4.2, with reference to soils of high volume change potential.

- 10.4.2 Due to ground gas protection requirements (See Section 8) suspended ground floor slabs may be required. On clay soils suitable underfloor voids would be necessary, based on the recommendations in NHBC Chapter 4.2, for soils of high volume change potential. This would be 100mm for cast in-situ concrete floor slabs, or 175mm for pre-cast concrete floor slabs.

10.5 Groundwater and Excavations

- 10.5.1 Groundwater was encountered during the monitoring period at depths of 0.69 m bgl to 2.00 m bgl. Groundwater levels may fluctuate due to seasonal or other effects, or extreme, prolonged meteorological events or periods.
- 10.5.2 Boreholes carried out as part of this or previous investigations may represent soft spots and conduits/sumps for groundwater or surface water. In excavations, such materials may also be loose and unstable. Unless specifically stated, exploratory hole locations should be regarded as approximate. Consideration should be given to accurate location of such features where it is considered they may impact on the proposed development.
- 10.5.3 The made ground deposits are generally in a loose state of compaction and may be subject to spalling and partial collapse within excavations. Deeper excavations are likely to be prone to rapid, unpredictable, large scale collapse. Consequently, temporary support should be considered for all excavations where collapse is to be avoided. Heavier duty closed shoring should be provided for any excavation where human entry is necessary, in compliance with statutory requirements to ensure safe working conditions. Low levels of carbon dioxide have been recorded from the made ground, hence care should be taken when personnel enter excavations or other confined spaces, to ensure full ventilation is available and appropriate safety precautions taken.

10.6 Pavement Design

California Bearing Ratio

- 10.6.1 It is assumed that the pavement subgrade/formation would be in near surface soils at an approximate depth of 0.60 m below existing ground levels. If ground levels are to be reduced, the formation level would need to be adjusted accordingly, and the specifying geotechnical engineer informed, so that an assessment of the appropriate soil layer can be made.
- 10.6.2 The near surface soils comprise variable made ground deposits, which indicates an equilibrium subgrade CBR value of <2.5 % (based upon Table 3.1 in Interim Advice Note 73/06 Rev 1 2009). This subgrade is considered unsuitable support for a pavement foundation and requires improvement. Options for improvement include; replacement of the weak soils with more suitable material, lime treatment, or the inclusion of geosynthetics.
- 10.6.3 It is recommended that the subgrade CBR value is verified immediately before placement of the pavement capping/subbase to confirm the minimum design CBR value. The design CBR value should not be increased on the basis of these tests. Should testing indicate a subgrade CBR less than the design value, then measures should be taken to improve the subgrade before proceeding with pavement construction.

10.7 Ground Aggressivity to Buried Concrete

10.7.1 Chemical analyses of 4 No. samples have been undertaken in accordance with BRE SD1 2005 “Concrete in aggressive ground” to determine their concrete classification.

Table 10.1 Concrete Classification Assessment

Strata	Details	Range	Concrete Class
Made Ground	Number of Tests	2	AC3 – DS3
	Water Soluble Sulphates (mg/l)	35 - 452	
	pH	8.9 – 10.7	
	Total Potential Sulphate %	0.02 – 0.88	
Alluvium	Number of tests	2	AC3 – DS1
	Water Soluble Sulphates (mg/l)	95 - 258	
	pH	5.3 – 5.9	
	Total Potential Sulphate %	0 – 0.01	

10.7.2 On the basis of the above assessment, and in accordance with BRE SD1 (2005) “Concrete in aggressive ground”, a Design Sulphate Class of DS3, with an ACEC of AC-3, would apply for all buried concrete.

11 CONCLUSIONS AND RECOMMENDATIONS

11.1 Conclusions

11.1.1 JNP Group has determined through desk-based research, intrusive investigation, laboratory testing, monitoring, and assessment that:

- Ground conditions at the site comprise made ground consisting of asphalt, and sub-base from ground level to depths of 0.90m bgl - 1.00m bgl. Alluvium was subsequently encountered to depths of 1.80m bgl - 2.60m bgl. Underlain by weathered mudstone of Pennine Middle Coal Measures Formation proven to depths of 3.00m bgl.
- Design Sulphate Class of DS3, with an ACEC of AC-3, would apply for all buried concrete.
- No risk to human health or controlled waters has been identified on site.
- The installation of a carbon dioxide monitor should be incorporated into the proposed building.
- Radon gas protection measures are not required.
- Traditional trench or pad foundations are considered feasible, placed within the weathered mudstone of the Pennine Middle Coal Measures Formation. An allowable bearing pressure of 125 kN/m² would be available between 1.50 – 2.00 m bgl, based upon standard 0.6 m wide foundations. Trench fill foundations may be required due to the increased thickness of made ground.

11.2 Recommendations

11.2.1 In line with the guidelines given LCRM and consequent to the ground investigation conclusions; JNP Group recommends that:

- A copy of this report is submitted to the Regulatory Authorities for their approval before any further work is undertaken at the site.

11.2.2 In addition, JNP Group recommends that the proposed development works are undertaken in accordance with the definition of Waste Code of Practice (DoWCoP); in following this guidance and to ensure materials are managed correctly, a Materials Management Plan will need to be prepared and declared in advance by a Qualified Person, then implemented and documented in a Verification Report. If this process is not undertaken, then following recent changes in Landfill Tax Regulations by HMRC. There is a risk of penalties equating to twice the Landfill Tax being applied to the re-use of material on site. If the proposed works are to be undertaken outside the DoWCoP, there would need to be some of Environmental Permitting or suitable equivalent. The requirements of such are likely to be more onerous and may take longer to be granted.

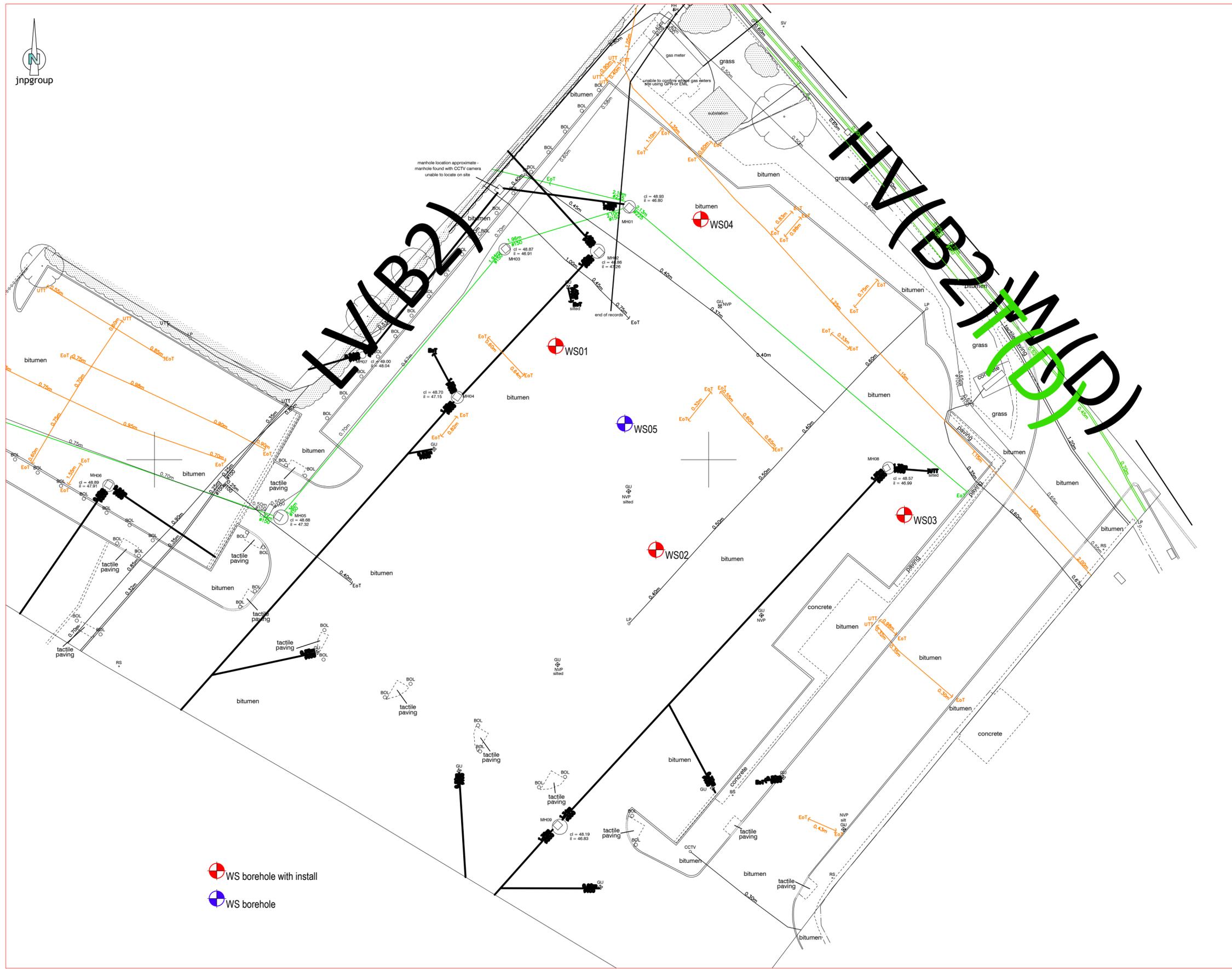
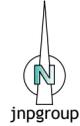
12 REFERENCES

1. BRE. 2005. Special Digest 1 : Concrete in Aggressive Ground. Building Research Establishment.
2. BS EN 1997-1:2004 Geotechnical design - Part 1 – General rules, British Standards Institution, London.
3. BS EN ISO 14688-1 Soil – Identification and description, British Standards Institution, London.
4. BS EN ISO 14688-2 Soil – Classification principles and quantitative description characteristics, British Standards Institution, London.
5. BS EN ISO 14689-1 Rock – Identification and description, British Standards Institution, London.
6. BS 1377. 1990. Methods of Test for soils for civil engineering purposes. British Standards Institution. London.
7. BS 5930. 2015 +A1 2019. Code of practice for site investigations. British Standards Institution. London.
8. BS 8485. 2015. Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings. British Standards Institution. London.
9. BS 8576. 2013. Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOC). British Standards Institution. London.
10. BS 10175. 2001+A1:2013 +A2:2017. Investigation of potentially contaminated sites - code of practice. British Standards Institution. London.
11. BS ISO 17924:2018. Soil quality – Assessment of human exposure from ingestion of soil and soil material – Procedure for the estimation of the human bioaccessibility / bioavailability of metals in soil. British Standards Institution. London.
12. BS ISO 18400-202:2018. Soil quality – Sampling. Part 202: Preliminary investigations. British Standards Institution. London.
13. BS ISO 18400-202:2018. Soil quality – Sampling. Part 203: Investigation of potentially contaminated sites. British Standards Institution. London.
14. BS ISO 18400-104:2018. Soil quality – Sampling. Part 104: Strategies. British Standards Institution. London.
15. Card G, Wilson S, Mortimore S. 2012. A Pragmatic Approach to Ground Gas Risk Assessment. CL:AIRE Research Bulletin RB17. CL:AIRE. London.
16. CL:AIRE and Chartered Institute of Environmental Health (CIEH). 2008. Guidance on Comparing Soil Contamination Data with a Critical Concentration. CL:AIRE / CIEH. London.
17. CL:AIRE. 2011. The Definition of Waste: Development Industry Code of Practice, Version 2. CL:AIRE London.
18. CL:AIRE. 2013. SP1010 – Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination. CL:AIRE. London.
19. CL:AIRE. 2016. Control of Asbestos Regulations 2012. Interpretation for managing and Working with Asbestos in Soil and Construction and Demolition Materials. Industry Guidance. CL:AIRE. London.

20. CL:AIRE. 2017. Petroleum Hydrocarbons in Groundwater: Guidance on assessing petroleum hydrocarbons using existing hydrogeological risk assessment methodologies. CL:AIRE. London.
21. Clayton C R I. 1995. The Standard Penetration Test (SPT) : Methods and use. CIRIA Report 143. Construction Industry Research Information Association, London.
22. CIRIA C665. 2007. Assessing Risks Posed by Hazardous Ground Gases to Buildings. CIRIA, London
23. CIRIA C733. 2014. Asbestos in Soil and Made Ground: A Guide to Understanding and Managing risks. CIRIA. London.
24. DEFRA. 2014. SP1010 - Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document. DEFRA. London.
25. Environment Agency. 2005. The UK Approach for Evaluating Human Health Risks from Petroleum Hydrocarbons in Soils. P5-080/TR3.
26. Environment Agency. 2006. Remedial Targets Methodology. Hydrogeological Risk Assessment for Land Contamination.
27. Environment Agency. 2008. Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values. Science Report SC050021/SR7.
28. Environment Agency. 2009. Human Health Toxicological Assessment of Contaminants in Soil. Science Report SC050021/SR2. Bristol.
29. Environment Agency. 2009. Updated technical background to the CLEA model. Science Report SC050021/SR3. Bristol.
30. Environment Agency. 2009. CLEA Software (Version 1.06) - Science Report SC050021/SR4. Bristol.
31. Environment Agency. 2010. Waste acceptance at landfills – Guidance on waste acceptance procedures and criteria. Bristol.
32. Environment Agency. 2013. Chemical Standards Database - <http://evidence.environment-agency.gov.uk/ChemicalStandards/ChemicalsByName.aspx>
33. Environment Agency. 2019. Land Contamination: Risk Management. UK Government Website - <https://www.gov.uk/guidance/land-contamination-how-to-manage-the-risks>.
34. Eurocode 7. 1997. Geotechnical Design - Part 3, Design assisted by field testing. Pre-standard ENV 1997-3. British Standards Institution, London.
35. Land Quality Management & Chartered Institute of Environmental Health (2015) The LQM/CIEH S4UL for Human Health Risk Assessment - LQM CIEH. Land Quality Press, Nottingham.
36. Society of Brownfield Risk Assessment. Development of Generic Assessment Criteria for Assessing Vapour Risks to Human Health from Volatile Contaminants in Groundwater. Version 1. February 2017.
37. Sowers G F. 1979. Introductory Soil Mechanics and Foundations. Macmillan.
38. Terzaghi K and R B Peck. 1967. Soil Mechanics in Engineering Practice, 2nd Edition. John Wiley, London.

39. TPH Criteria Working Group. 1997. Total Petroleum Hydrocarbon Group Series. Volume 3. Selection of Representative TPH Fractions Based on Fate and Transport Considerations.
40. Water Framework Directive UK Technical Advisory Group. 2014. River and Lake Assessment Method Specific Pollutants (metals); Metal Bioavailability Assessment Tool (M-BAT). Scotland.
41. Wilson S, Card G and Haines S. 2008. Ground Gas Handbook. Dunbeath. Whittles Publishing.

FIGURES / DRAWINGS



WS borehole with install
 WS borehole

General Notes

- Where this drawing has been issued in electronic .dwg format, it has been done so in good faith. JNP Group do not take any responsibility for any inaccuracies in the electronic data, which should be checked against the paper (or .pdf) drawing issue. Any apparent discrepancies should be immediately reported to JNP Group. The electronic .dwg file should not be assumed to be to scale and should not be used for 'overlying', setting out or checking of any third party information. All dimensions should be taken from the paper (or .pdf) version of the drawing. Electronic drawings may contain third party information. JNP Group take no responsibility for this information, which should be checked against the originators paper drawing(s).
- All dimensions are millimetres (mm), and levels are in metres (m) unless noted otherwise and should be checked on site prior to construction/fabrication.
- Do not scale from this drawing. Only figured dimensions are to be relied upon. Don't hesitate to get in touch with JNP Group if additional information is required.
- Any discrepancies between drawings of different scales and between drawings and specifications, where appropriate, to be reported to JNP Group for decision.
- Copyright reserved. This drawing may only be used for The Client and location specified in the title block. It may not be copied or disclosed to any third party without the prior written consent of JNP Group.
- This drawing should only be used for construction if the drawing status is "A4 - Approved/Stage Complete". JNP Group takes no responsibility for construction works undertaken to drawings that are not marked with this status.

Rev.	Date	Description	Dr / Chk'd / App'd
P02	30/07/2024	Updated hole locations from GI	LS
P01	01/07/2024	First issue	LK/JP
Substability: S2 - Suitable for Information			

JNP GROUP
 CONSULTING ENGINEERS
 • Amersham • Brighouse • Bristol • Glasgow
 • Hartlepool • Sheffield • Warwick
 www.jnpgroup.co.uk

Client: **BKUK Group**
 Job: **BKUK Barnsley**
 Title: **Exploratory Hole Plan**

Health & Safety Note
 The details on this drawing have been prepared on the assumption that a competent contractor will be carrying out the works. If the contractor(s) considers that there is insufficient Health and Safety information on this drawing, this should immediately be brought to the attention of the designer.

HAZARD IDENTIFICATION BOX

This table is provided to assist the Principal Contractor to fulfil their obligations under the CDM Regulations 2015

Hazard Ref	Hazard Type (Construction/Maintenance/ Clearing/Demolition/Adaptation)	Hazard Description	Mitigation Measures/ Residual Risk
1			

Classification: **FL_60_20**
 Scale @ A2: **Not to scale**

Project - Originator - Volume/System - Level/Location - Type - Discipline - Number: **M44628-JNP-XX-XX-DR-G-7001**
 Document/Drawing Number: **P02**

Figure 1

Site Location Plan

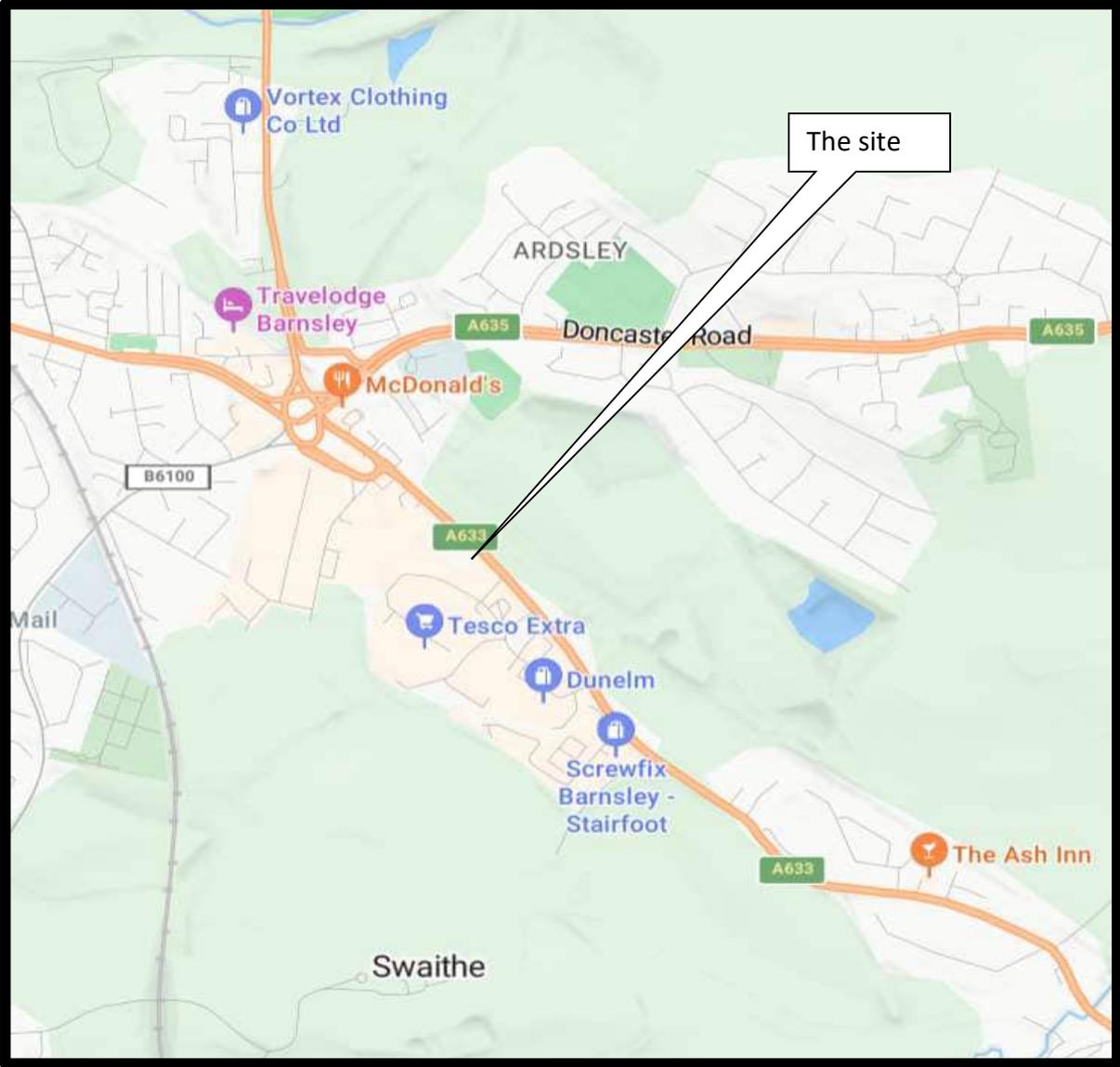


Project:

BKUK Barnsley

Project No:

M44628



Reproduced from Ordnance Survey with the permission of the National Mapping Agency of Great Britain.
Crown Copyright Reserved Licence No. AL813427

Figure 2

SPT / Depth Relationship



Project:
BKUK Barnsley

Project No:
M44628

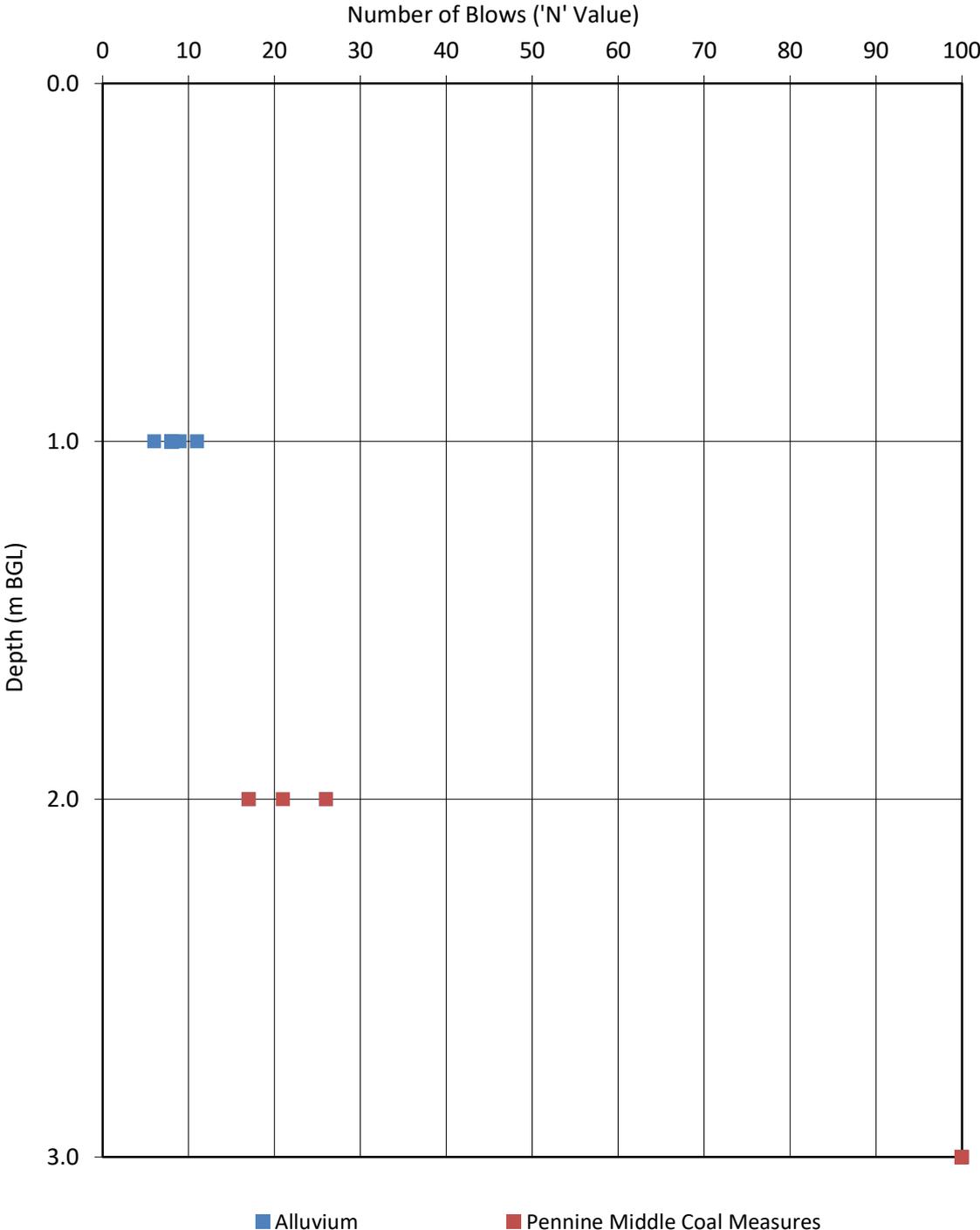


Figure 3

Undrained Shear Strength / Depth Relationship

Project:

BKUK Barnsley

Project No:

M44628

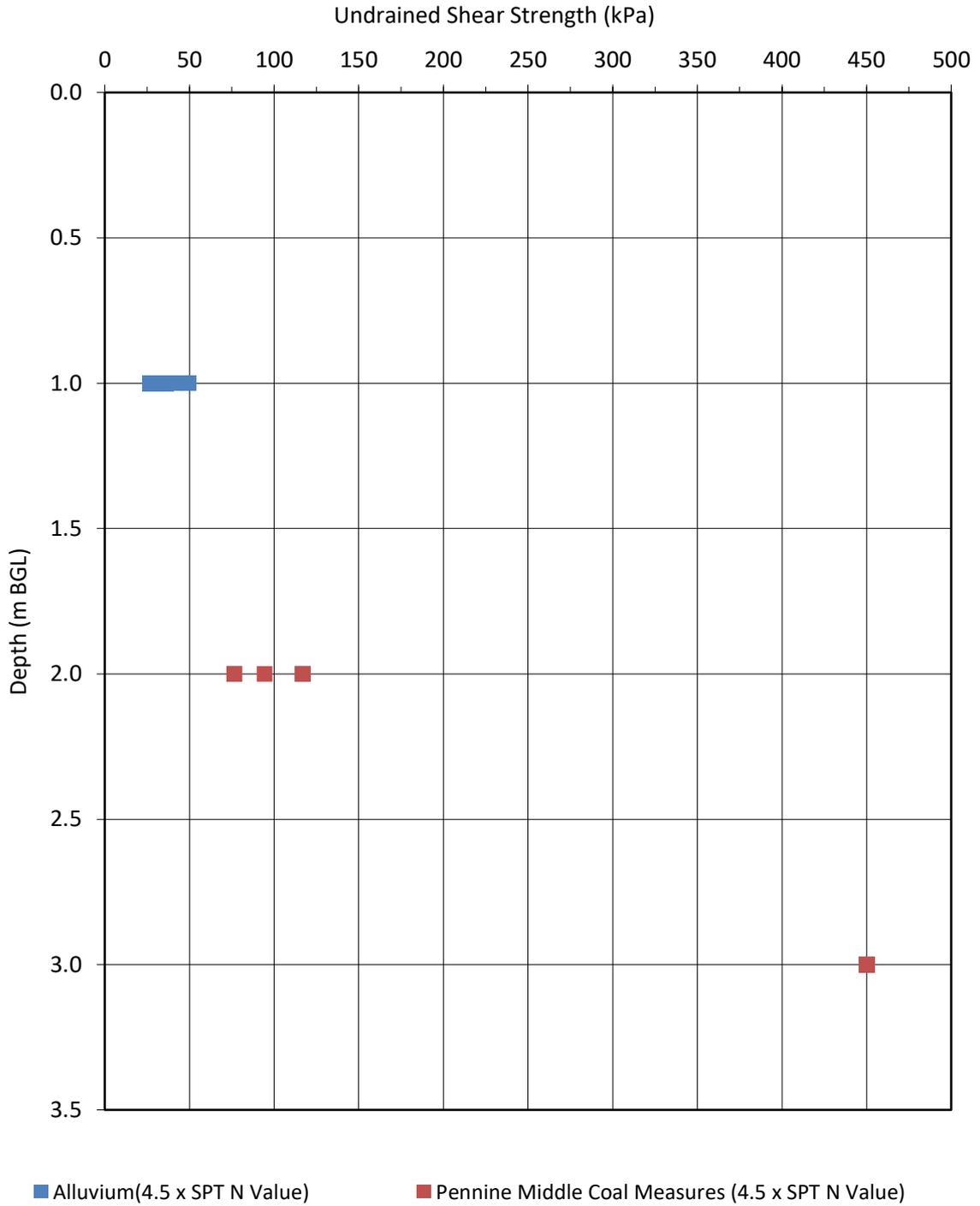


Figure 4

Plasticity Index Chart



Project:

BKUK Barnsley

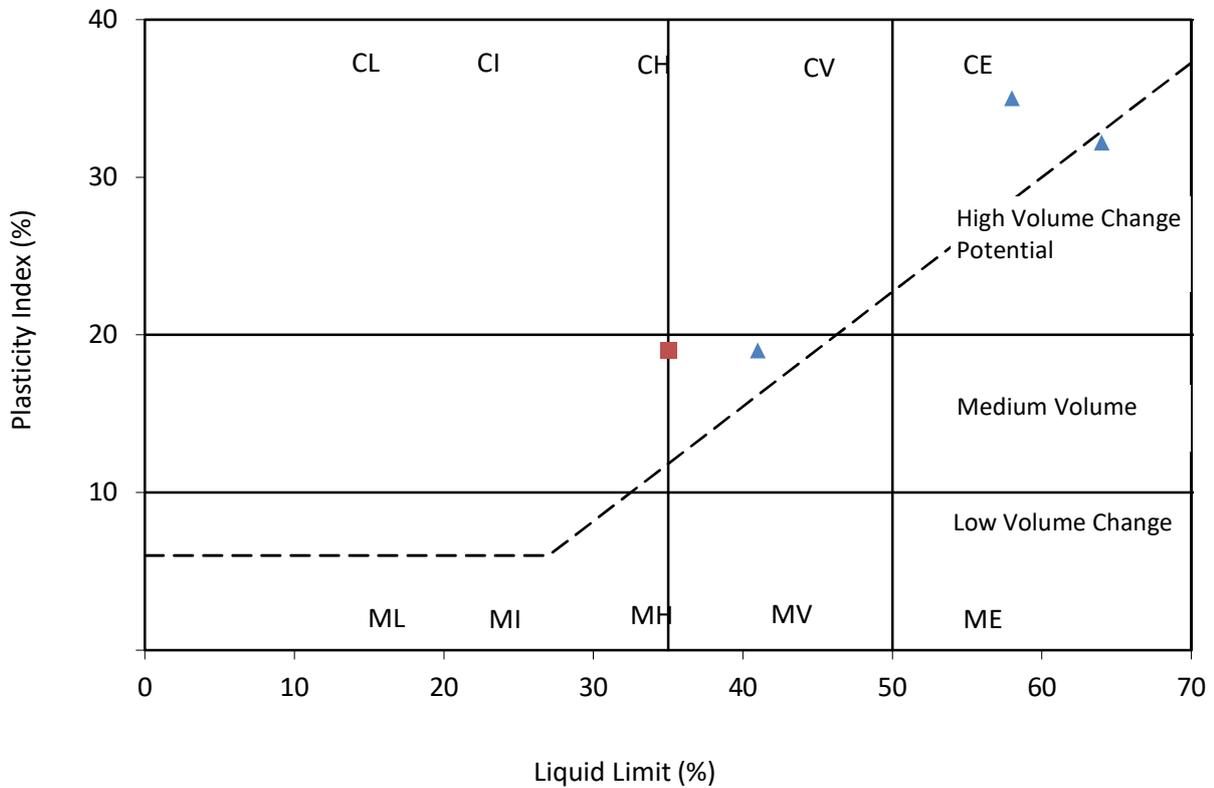
Project No:

M44628

Key:

C Clay M Silt

- L Low plasticity
- I Intermediate plasticity
- H High plasticity
- V Very high plasticity
- E Extremely high plasticity



▲ Alluvium ■ Pennine Middle Coal Measures - - - A Line

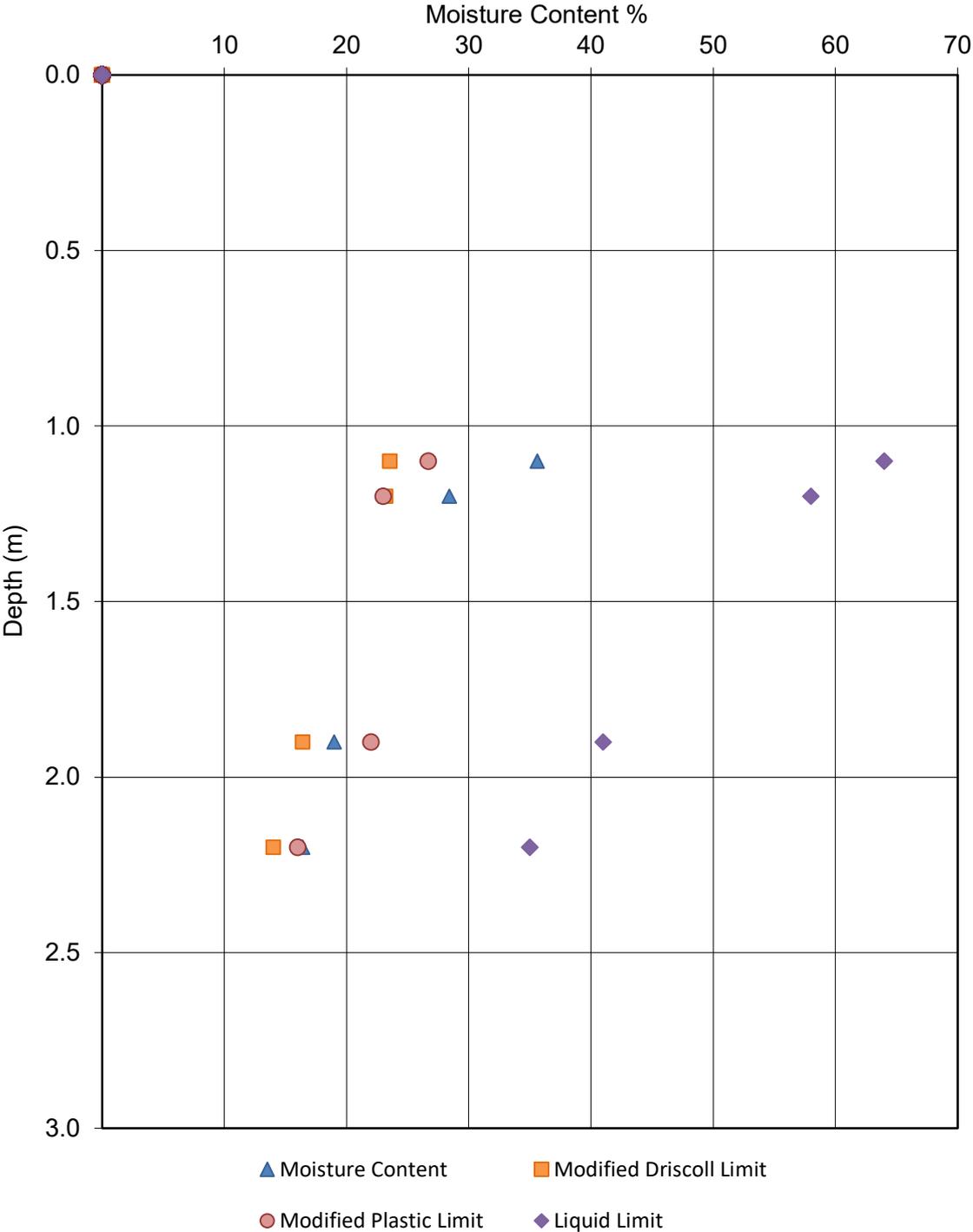
Figure 5

Moisture Content / Depth Relationship

Project:
BKUK Barnsley



Project No:
M44628



APPENDIX A: LIMITATIONS

INTRODUCTION

This report is confidential and has been prepared solely for the benefit of the client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from JNP Group; a charge may be levied against such approval. JNP Group accepts no responsibility or liability for the consequences of this document being used for any purpose or project other than for which it was commissioned, and: this document to any third party with whom and agreement has not been executed.

Any comments given within this report are based on the understanding that the proposed works to be undertaken will be as described in the introduction and the information referred to and provided by others and will be assumed to be correct and will not have been checked by JNP Group and JNP Group will not accept any liability or responsibility for any inaccuracy in such information.

Any deviation from the recommendations or conclusions contained in this report should be referred to JNP Group in writing for comment and JNP Group reserve the right to reconsider their recommendations and conclusions contained within. JNP Group will not accept any liability or responsibility for any changes or deviations from the recommendations noted in this report without prior consultation and our full approval.

The details contained within this report reflect the site conditions prevailing at the time of investigation. JNP Group warrants the accuracy of this report up to and including that date. Additional information, improved practice or changes in legislation may necessitate this report having to be reviewed in whole or in part after that date. If necessary, this report should be referred back to JNP Group for re-assessment and, if necessary, re-appraisal.

This report is only valid when used in its entirety. Any information or advice included in the report should not be relied upon until considered in the context of the whole report. Whilst this report and the opinion made herein are correct to the best of JNP Group' belief, JNP Group cannot guarantee the accuracy or completeness of any information provided by third parties.

The report represents the finding and opinions of experience geotechnical and geo-environmental engineers. JNP Group does not provide legal advice and the advice of lawyers may also be required.

It should be noted that the following were not included as part of the agreed scope of works with the client: detailed ecological surveys and assessment.

JNP Group has provided advice and made recommendations based on the findings of the work undertaken, however this is subject to the approval / acceptance by the relevant Regulatory Authorities.

Objectives

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. 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, JNP Group reserves the right to review such information and, if warranted, to modify the opinions accordingly. It should be noted

that any risks identified in this report are perceived risks based on the information reviewed; actual risks can only be assessed following a physical investigation of the site.

Phase II Intrusive Investigations

The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, and ground and groundwater conditions to allow a reasonable risk assessment to be made.

Where intrusive investigations have been undertaken, they have been designed to provide a reasonable level of assurance on the conditions. Given the discrete nature sampling, no investigation technique is capable of identifying all conditions present in all areas. The number of sampling points and the methods of sampling and testing do not preclude the existence of localised “hotspots” of contamination where concentrations may be significantly higher than those actually encountered. The risk assessment and opinions provided, inter alia, take into consideration 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.

The objectives of the investigation have been linked to establishing the risks associated with potential human targets, building materials, the environment (including adjacent land), and to surface and ground water. 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 areas unoccupied by the building(s) on the site and by buried services.

Gas and groundwater levels may vary from those reported due to seasonal, or other effects.

Although preliminary comment has have been provided by JNP Group regarding UXO and Invasive Species, JNP Group not experts in these and as such specialist advice should be sought regarding the presence of UXO and invasive species at the site.

Gas Membranes

Where JNP Group are commissioned to undertake the inspection and validation of a gas membrane, we, at the time of inspection, will ensure that the membrane is laid in accordance with the relevant arrangements and sections. At that time we will ensure that the venting media is laid correctly in preparation of the membrane and we will ensure that any tears in the membrane or bad workmanship is reported and instructions given to be rectified. Thereafter it is the duty of the Principal Contractor to ensure that tears and defects are rectified.

Remediation and Verification Reports Limitations

The risk assessment and opinions provided, inter alia, take into consideration 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.

Where intrusive investigations have been undertaken, they have been designed to provide a reasonable level of assurance on the conditions. Given the discrete nature sampling, no investigation technique is capable of identifying all conditions present in all areas. The number of sampling points and the methods of sampling and testing do not preclude the existence of localised “hotspots” of contamination where concentrations may be significantly higher than those actually encountered.

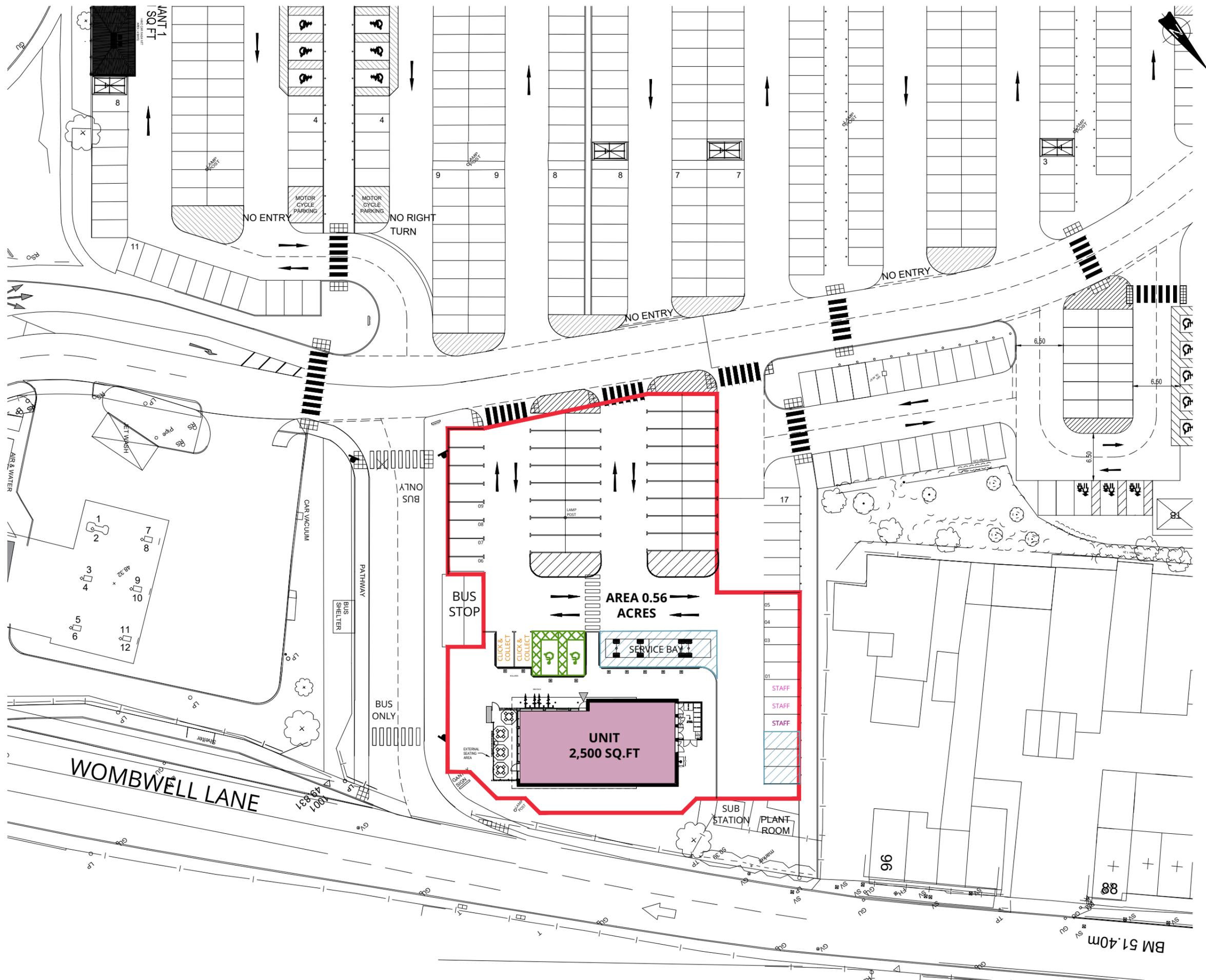
If costs have been included in relation to the site remediation these must be confirmed by a qualified quantity surveyor. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only to the purpose for which the report was commissioned. The

information reviewed from Third Party 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, JNP Group reserves the right to review such information and, if warranted, to modify the opinions accordingly.

Whilst this report and the opinion made herein are correct to the best of JNP Group's belief, JNP Group cannot guarantee the accuracy or completeness of any information provided by third parties.

Gas and groundwater levels may vary from those reported due to seasonal, or other effects.

APPENDIX B: THIRD PARTY DRAWINGS



Copyright of this drawing is the property of Urban Edge Architecture Limited. It must not be reproduced or amended nor used in the execution of any works whether in conjunction with the proposed works for which it is prepared or otherwise without the express consent in writing of Urban Edge Architecture Limited.

Urban Edge Architecture Limited
 One Scotgate Mews, Scotgate,
 Stamford, Lincolnshire, PE9 2FX.
 Tel. ++44 (0)1780 755 665
 Fax. ++44 (0)1780 755 360

DO NOT SCALE FROM THIS DRAWING - ALL DIMENSIONS TO BE CHECKED ON SITE, ANY DISCREPANCIES RAISED WITH URBAN EDGE

DRAWING TO BE READ IN COLOUR

SITE ADDRESS:
 WOMBWELL LANE
 BARNSELY
 S70 3NS

LEGEND:
PLANNING APPLICATION

CAR PARKING NUMBERS:

PARKING NUMBERS				
CAR PARKING	CLICK & COLLECT	DISABLED BAYS	STAFF BAYS	TOTAL
9	2	2	3	16

KEY:

- = SERVICE ZONE NO PARKING
- = DISABLED PARKING SPACES
- = STAFF = CLICK & COLLECT BAY
- = CLICK & COLLECT

P00b	KEY ADDED	ND	15.05.24
P00a	KEY ADDED	ND	10.05.24
Rev No	Description	Drawn By	Date



Client
BKUK GROUP LIMITED

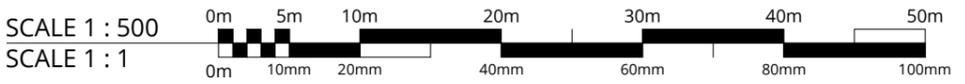
Project
BURGER KING BARNSELY

Drawing
**PROPOSED BLOCK PLAN
 2500 SQ.FT
 DRIVE-TO UNIT**

Issue Purpose
PLANNING

UE Proj No	Scale	Date	Drawn	Status	Revision
2763	A3 @ 1:500	APRIL 2024	ND	-	P00b

Project - Organisation - Volume/System - Level - Type - Role - Number
2763-URB-BA-XX-DR-A-208151



APPENDIX C: PHOTO DOCUMENT



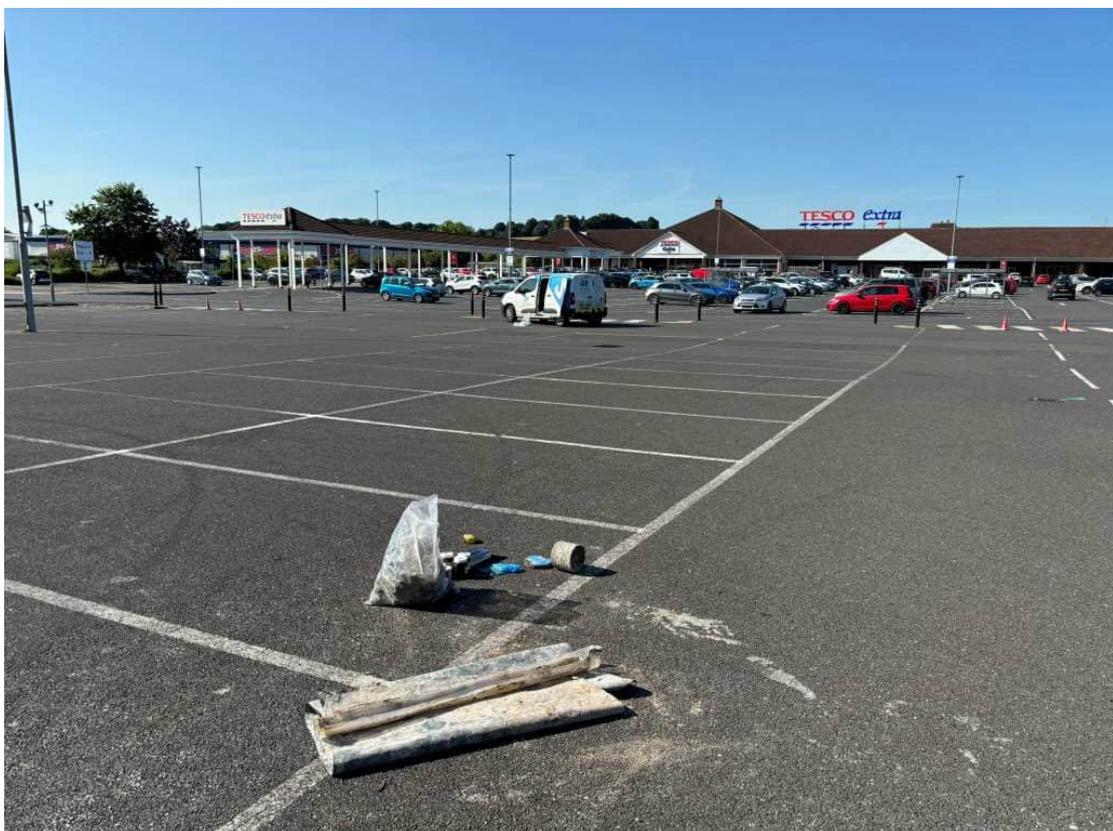
Facing the north-east corner of the site.



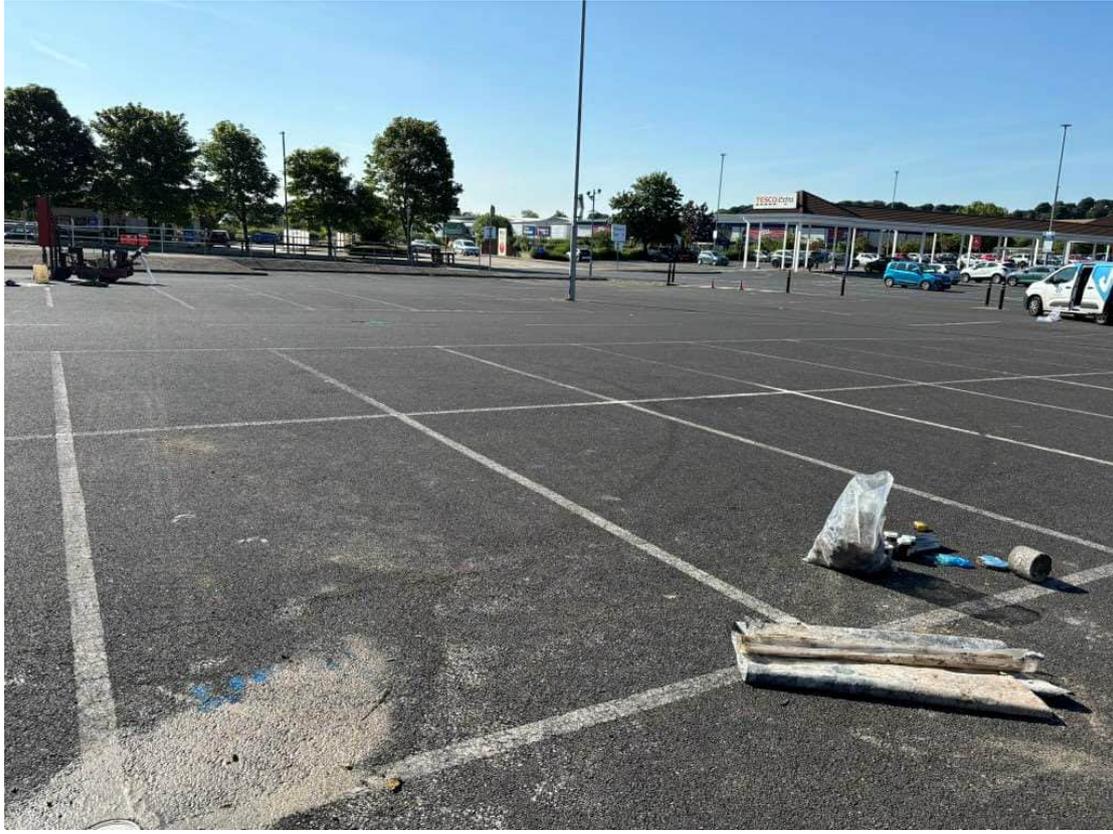
Facing the north-west corner of the site.



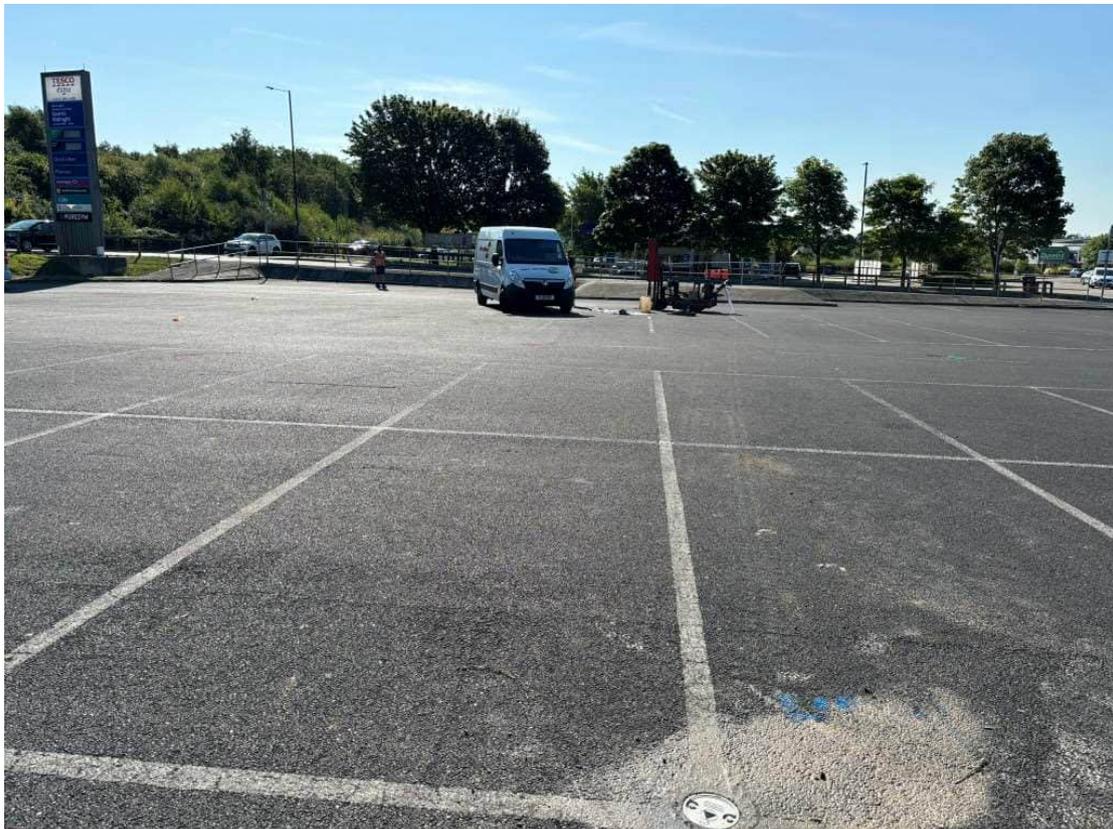
Facing west towards the supermarket.



Facing south-west corner of the site.



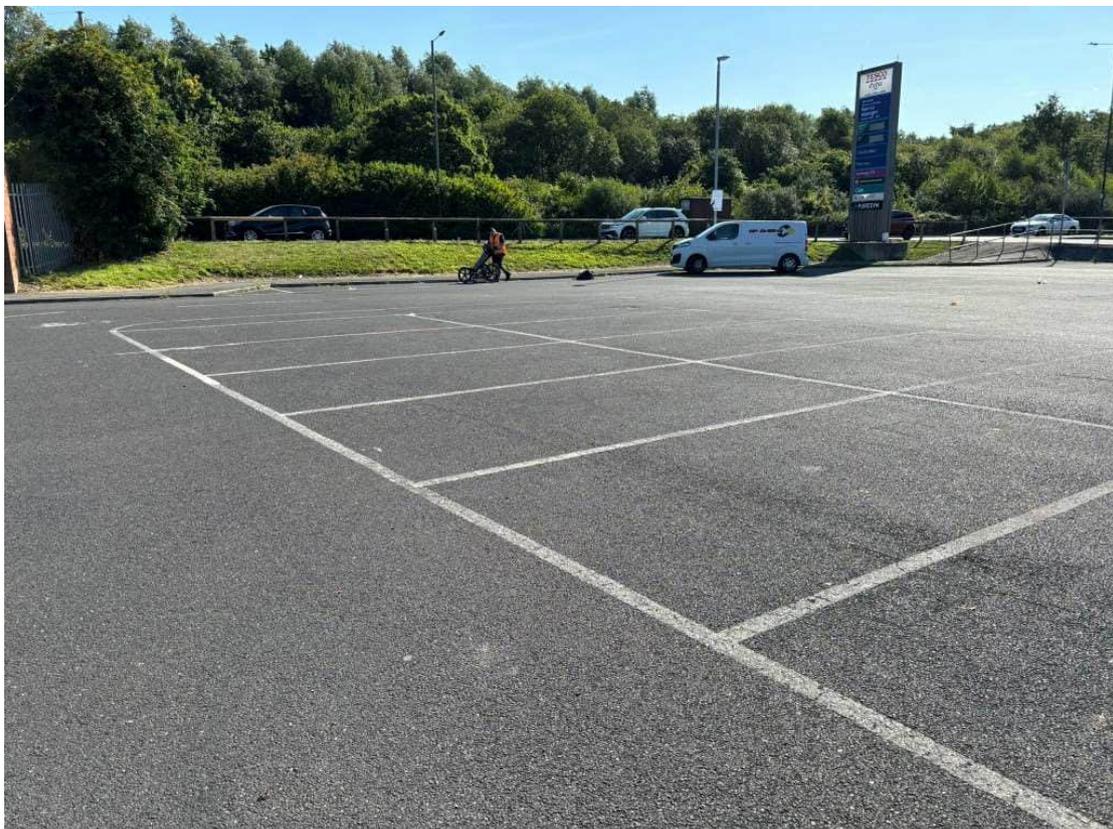
Facing the south-west corner of the site.



Facing south-east corner of the site.



Facing south-east corner of the site facing Wombwell Lane.



Facing towards Wombwell Lane.



Facing west of the site towards the supermarket.



Facing west of the site towards the supermarket.



WS01



WS01 Sampling.



WS01 Monitoring well.



WS02



WS02 Sampling.



WS02 Monitoring well



WS03



WS03 Sampling



WS03 Monitoring well.



WS04



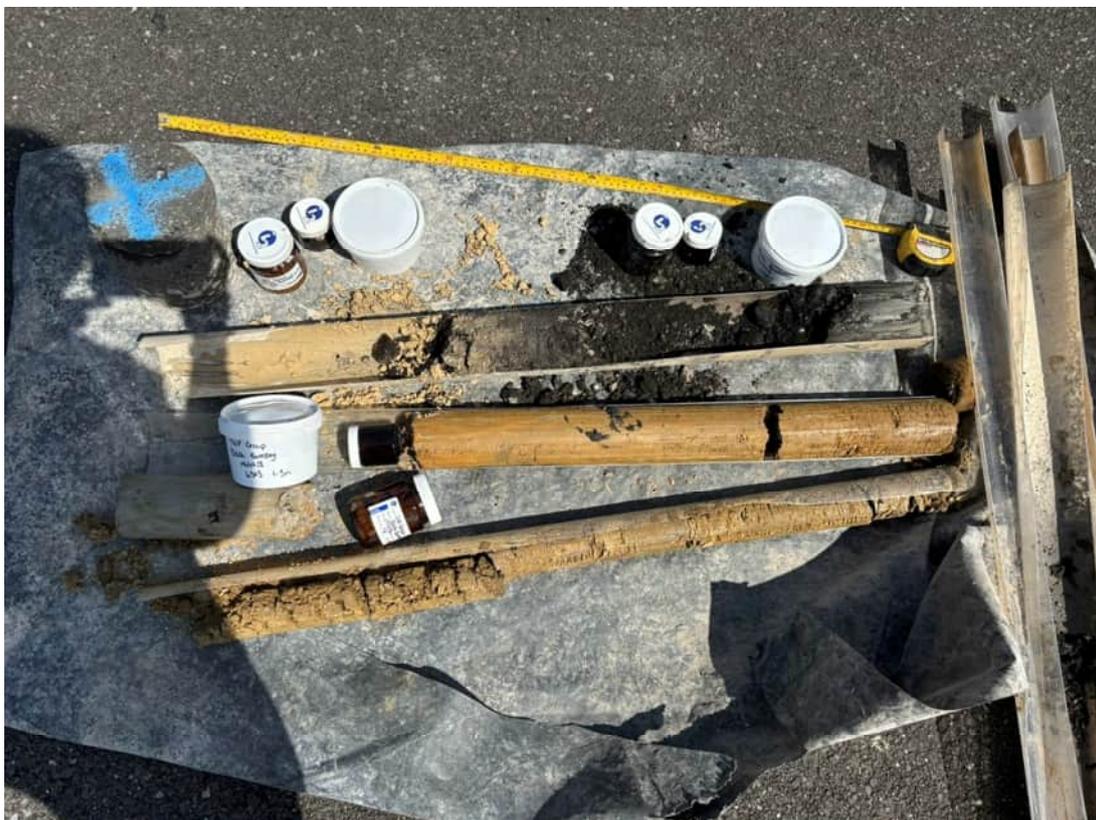
WS04 Sampling.



WS04 Monitoring well.



WS05



WS05 Sampling.



WS05 Reinstated.

APPENDIX D: EXPLORATORY HOLE RECORDS

Borehole Log

Borehole No.

WS01

Sheet 1 of 1

Project Name: BKUK Barnsley

Project No.
M44628

Co-ords: 437585.00 - 405213.00

Hole Type
WS

Location: Barnsley

Level: 48.925

Scale
1:25

Client: BKUK

Dates: 29/07/2024 - 29/07/2024

Logged By
LS

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.30		Tarmac. MADE GROUND	1	
		0.45 0.45	D ES		0.60		Cream slightly sandy GRAVEL. Gravel is sub-base angular sandstone. MADE GROUND		
		0.80	ES		0.90		Black sandy GRAVEL. Gravel is angular to sub-angular sandstone, red brick and tarmac. MADE GROUND		
		1.00		N=9 (2,1/2,2,2,3)	1.00		Brown sandy gravelly CLAY. Gravel is angular to sub-angular sandstone. ALLUVIUM		
		1.20 1.20	D ES				Firm to stiff orange grey mottled CLAY. ALLUVIUM		
		2.00		N=26 (3,4/5,7,7,7)	2.00		Firm to stiff orange grey mottled slightly sandy CLAY. ALLUVIUM		2
		2.70 2.70	D ES		2.50		Light brown clayey weathered MUDSTONE. PENNINE MIDDLE COAL MEASURES		
		3.00		50 (25 for 85mm/50 for 80mm)	3.00		End of borehole at 3.00 m		3
								4	
								5	

Remarks
Refusal on rockhead at 3.00m bgl.

Borehole Log

Borehole No.

WS03

Sheet 1 of 1

Project Name: BKUK Barnsley	Project No. M44628	Co-ords: 437613.00 - 405195.00	Hole Type WS
Location: Barnsley		Level: 48.65	Scale 1:25
Client: BKUK		Dates: 29/07/2024 - 29/07/2024	Logged By LS

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.12		Tarmac. MADE GROUND		
		0.30 0.30	D ES				Cream slightly sandy GRAVEL. Gravel is sub-base angular sandstone. MADE GROUND		
		0.70 0.70	D ES		0.50		Black sandy GRAVEL. Gravel is angular sandstone, tarmac and red brick. MADE GROUND		
		1.00		N=6 (2,1/1,2,2,1)	1.00				
		1.90 1.90 2.00	D ES	N=17 (3,3/3,3,5,6)					
		2.60	ES		2.60		Orange weathered MUDSTONE. PENNINE MIDDLE COAL MEASURES		
		3.00		50 (25 for 95mm/50 for 85mm)	3.00		End of borehole at 3.00 m		

Remarks
Refusal on rockhead at 3.00m bgl.

Borehole Log

Borehole No.

WS04

Sheet 1 of 1

Project Name: BKUK Barnsley

Project No.
M44628

Co-ords: 437606.00 - 405222.00

Hole Type
WS

Location: Barnsley

Level: 48.52

Scale
1:25

Client: BKUK

Dates: 29/07/2024 - 29/07/2024

Logged By
LS

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20 0.20	D ES		0.10		Tarmac. MADE GROUND		
					0.40		Cream sandy GRAVEL. Gravel is sub-base angular sandstone. MADE GROUND		
		0.60 0.60	D ES				Grey sandy gravelly CLAY. Gravel is angular to sub-angular tarmac, mudstone, red brick and sandstone. MADE GROUND		
		1.00 1.10 1.10	D ES	N=11 (1,1/2,2,3,4)	1.00		Firm orange grey mottled CLAY. ALLUVIUM	1	
		2.00 2.20 2.20	D ES	N=17 (4,4/4,4,4,5)	2.00		Orange brown sandy weathered MUDSTONE. PENNINE MIDDLE COAL MEASURES	2	
		3.00		50 (10,11/50 for 195mm)	3.00		End of borehole at 3.00 m	3	
								4	
								5	

Remarks
Refusal on rockhead at 3.00m bgl.

Borehole Log

Borehole No.

WS05

Sheet 1 of 1

Project Name: BKUK Barnsley	Project No. M44628	Co-ords: 437609.00 - 405210.00	Hole Type WS
Location: Barnsley		Level: 48.70	Scale 1:25
Client: BKUK		Dates: 29/07/2024 - 29/07/2024	Logged By LS

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
Well		0.15 0.15	D ES		0.14		Tarmac. MADE GROUND		
							Cream slightly sandy GRAVEL. Gravel is sub-base angular sandstone. MADE GROUND		
		0.65 0.65	D ES		0.60		Black GRAVEL. Gravel is angular to sub-angular tarmac, sandstone and red brick. MADE GROUND		
		1.00		N=8 (1,1/2,2,2,2)	1.00		Firm orange grey mottled CLAY. ALLUVIUM	1	
		1.30 1.30	D ES		1.80		Orange/ brown weathered MUDSTONE. PENNINE MIDDLE COAL MEASURES	2	
	3.00		50 (25 for 85mm/50 for 115mm)	3.00		End of borehole at 3.00 m	3		
								4	
								5	

Remarks
Refusal on rockhead at 3.00m bgl.

APPENDIX E: MONITORING RESULTS

GAS MONITORING DATA



Site:	BKUK Barnsley		
Project:	M44628	Date:	05/08/2024

Operator:	Leona Schofield
Weather:	Sunny

Monitoring Location	Standpipe diameter (mm)	Standpipe Depth (m bgl)	Water Level (m bgl)	Atmos. Pressure (mb)	Initial Flow Rate (litres/hr)	Average Flow Rate (litres/hr)	Temp (°C)	Reading Duration (s)	CH ₄ (% v/v)	CO ₂ (% v/v)	O ₂ (% v/v)	PID	Notes
WS01	55	1.00 - 3.00	1.75	1006	0.0	0.0	20	15	0.0	4.5	7.0		
								30	0.0	5.5	6.2		
								60	0.0	5.7	5.9		
								90	0.0	5.7	5.8		
								120	0.0	5.8	5.7		
								180	0.0	5.7	5.7		
								240	0.0	5.7	5.7		
WS02	55	0.50 - 1.50	0.74	1006	0.0	0.0	20	15	0.0	0.3	15.8		
								30	0.0	0.4	10.8		
								60	0.0	0.4	10.0		
								90	0.0	0.4	9.7		
								120	0.0	0.4	9.8		
								180	0.0	0.4	9.9		
								240	0.0	0.4	10.2		
WS03	55	1.00 - 3.00	2.00	1006	0.4	0.4	20	15	0.0	0.8	18.9		
								30	0.0	1.2	18.0		
								60	0.0	1.2	17.7		
								90	0.0	1.5	17.0		
								120	0.0	1.7	16.5		
								180	0.0	1.9	16.2		
								240	0.0	1.9	16.3		
WS04	55	1.00 - 3.00	2.10	1006	0.0	0.0	20	15	0.0	0.4	13.6		
								30	0.0	0.4	13.2		
								60	0.0	0.4	13.1		
								90	0.0	0.4	13.1		
								120	0.0	0.4	13.1		
								180	0.0	0.4	13.1		
								240	0.0	0.4	13.1		
							300	0.0	0.4	13.1			

GAS MONITORING DATA



Site:	BKUK Barnsley		
Project:	M44628	Date:	22/08/2024

Operator:	Louis Keane
Weather:	Overcast

Monitoring Location	Standpipe diameter (mm)	Standpipe Depth (m bgl)	Water Level (m bgl)	Atmos. Pressure (mb)	Initial Flow Rate (litres/hr)	Average Flow Rate (litres/hr)	Temp (°C)	Reading Duration (s)	CH ₄ (% v/v)	CO ₂ (% v/v)	O ₂ (% v/v)	PID	Notes								
WS01	55	1.00 - 3.00	1.26	1001	0.0	0.0	18	15	0.0	0.5	20.4										
								30	0.0	0.7	20.4										
								60	0.0	1.8	19.4										
								90	0.0	2.3	18.7										
								120	0.0	2.8	18.2										
								180	0.0	3.5	17.5										
								240	0.0	3.8	17.2										
								300	0.0	4.2	16.2										
								360	0.0	4.7	12.4										
								420	0.0	4.8	10.8										
WS02	55	0.50 - 1.50	0.69	1001	0.6	0.6	18	15	0.0	0.4	17.5										
								30	0.0	0.3	19.6										
								60	0.0	0.3	19.3										
								90	0.0	0.4	18.8										
								120	0.0	0.4	18.6										
								180	0.0	0.5	18.1										
								240	0.0	0.5	18.0										
								300	0.0	0.5	18.0										
								WS03	55	1.00 - 3.00	1.83	1001	0.0	0.0	18	15	0.0	0.5	18.0		
																30	0.0	0.5	18.0		
60	0.0	0.5	18.0																		
90	0.0	0.5	18.1																		
120	0.0	0.5	18.1																		
180	0.0	0.5	18.5																		
240	0.0	0.5	18.4																		
300	0.0	0.5	18.4																		
WS04	55	1.00 - 3.00	2.00	1001	0.0	0.0	18									15	0.0	0.6	18.5		
																30	0.0	0.6	18.3		
								60	0.0	0.6	18.2										
								90	0.0	0.6	18.2										
								120	0.0	0.6	18.2										
								180	0.0	0.6	18.2										
								240	0.0	0.6	18.3										
								300	0.0	0.6	18.3										

GAS MONITORING DATA



Site:	BKUK Barnsley		
Project:	M44628	Date:	03/09/2024

Operator:	BR
Weather:	Overcast

Monitoring Location	Standpipe diameter (mm)	Standpipe Depth (m bgl)	Water Level (m bgl)	Atmos. Pressure (mb)	Initial Flow Rate (litres/hr)	Average Flow Rate (litres/hr)	Temp (°C)	Reading Duration (s)	CH ₄ (% v/v)	CO ₂ (% v/v)	O ₂ (% v/v)	PID	Notes
WS01	55	1.00 - 3.00	1.78	1004	0.0	0.0	15	15	0.0	10.6	4.6		
								30	0.0	10.7	4.5		
								60	0.0	10.7	4.4		
								90	0.0	10.7	4.3		
								120	0.0	10.8	4.3		
								150	0.0	10.9	4.2		
								180	0.0	10.9	4.2		
								210	0.0	10.9	4.2		
								240	0.0	10.9	4.0		
								270	0.0	10.3	3.8		
300	0.0	9.9	3.5										
WS02	55	0.50 - 1.50	0.75	1004	0.0	0.0	15	15	0.0	1.0	15.5		
								30	0.0	0.9	15.3		
								60	0.0	0.9	15.2		
								90	0.0	0.9	15.1		
								120	0.0	0.9	15.1		
								150	0.0	0.9	15.0		
								180	0.0	0.9	15.0		
								240	0.0	0.9	15.0		
								300	0.0	0.9	15.0		
								WS03	55	1.00 - 3.00	1.72	1004	0.0
30	0.0	2.3	19.0										
60	0.0	3.2	18.2										
90	0.0	3.3	18.1										
120	0.0	3.4	18.1										
150	0.0	3.4	18.0										
180	0.0	3.4	18.0										
210	0.0	3.4	18.0										
240	0.0	3.3	18.0										
270	0.0	3.2	18.0										
WS04	55	1.00 - 3.00	2.20	1004	0.0	0.0	15	15	0.0	2.7	14.8		
								30	0.0	2.6	15.3		
								60	0.0	2.5	15.4		
								90	0.0	2.5	15.5		
								120	0.0	2.5	15.5		
								180	0.0	2.5	15.5		
								240	0.0	2.5	15.5		
								300	0.0	2.5	15.5		

GAS MONITORING DATA



Site:	BKUK Barnsley		
Project:	M44628	Date:	16/09/2024

Operator:	LK
Weather:	Sunny

Monitoring Location	Standpipe diameter (mm)	Standpipe Depth (m bgl)	Water Level (m bgl)	Atmos. Pressure (mb)	Initial Flow Rate (litres/hr)	Average Flow Rate (litres/hr)	Temp (°C)	Reading Duration (s)	CH ₄ (% v/v)	CO ₂ (% v/v)	O ₂ (% v/v)	PID	Notes
WS01	55	1.00 - 3.00	1.67	1031	3.0	3.0	18	15	0.0	5.0	10.7		Peak flow 27.6 l/h
								30	0.0	8.4	8.0		
								60	0.0	10.5	4.1		
								90	0.0	11.6	2.1		
								120	0.0	12.0	1.5		
								180	0.0	12.2	1.1		
								240	0.0	11.9	0.9		
WS02	55	0.50 - 1.50	0.70	1031	5.6	0.0	18	15	0.0	0.2	20.8		
								30	0.0	0.1	21.0		
								60	0.0	0.1	21.0		
								90	0.0	0.2	21.0		
								120	0.0	0.2	21.0		
								180	0.0	0.2	21.0		
								240	0.0	0.2	20.8		
WS03	55	1.00 - 3.00	2.89	1031	0.0	0.0	18	15	0.0	0.4	20.3		
								30	0.0	0.4	20.7		
								60	0.0	0.7	20.6		
								90	0.0	0.8	20.5		
								120	0.0	0.8	20.4		
								180	0.0	1.3	20.1		
								240	0.0	1.7	19.6		
								300	0.0	2.0	19.3		
								360	0.0	2.0	19.0		
								420	0.0	1.9	19.0		
WS04	55	1.00 - 3.00	1.95	1031	2.7	0.0	18	15	0.0	0.8	19.0		
								30	0.0	1.0	19.1		
								60	0.0	1.8	17.7		
								90	0.0	2.3	16.5		
								120	0.0	2.7	15.5		
								180	0.0	3.1	14.9		
								240	0.0	3.2	14.6		
300	0.0	3.2	14.5										
360	0.0	3.0	14.7										

GAS MONITORING DATA



Site:	BKUK Barnsley		
Project:	M44628	Date:	01/10/2024

Operator:	BR
Weather:	Raining

Monitoring Location	Standpipe diameter (mm)	Standpipe Depth (m bgl)	Water Level (m bgl)	Atmos. Pressure (mb)	Initial Flow Rate (litres/hr)	Average Flow Rate (litres/hr)	Temp (°C)	Reading Duration (s)	CH ₄ (% v/v)	CO ₂ (% v/v)	O ₂ (% v/v)	PID	Notes
WS01	55	1.00 - 3.00	1.54	1013	0.0	0.0	13	15	0.0	8.5	2.4		
								30	0.0	9.0	1.1		
								60	0.0	9.2	0.5		
								90	0.0	9.3	0.4		
								120	0.0	9.3	0.3		
								180	0.0	9.3	0.3		
								240	0.0	9.3	0.4		
300	0.0	9.3	0.5										
WS02	55	0.50 - 1.50	0.67	1013	0.0	0.0	13	15	0.0	1.7	18.7		
								30	0.0	1.7	18.6		
								60	0.0	1.8	18.5		
								90	0.0	1.8	18.4		
								120	0.0	1.8	18.4		
								180	0.0	1.8	18.4		
								240	0.0	1.8	18.2		
300	0.0	1.8	18.3										
WS03	55	1.00 - 3.00	1.50	1013	0.0	0.0	13	15	0.0	2.8	19.2		
								30	0.0	3.1	18.8		
								60	0.0	3.1	18.8		
								90	0.0	3.1	18.7		
								120	0.0	3.1	18.8		
								180	0.0	2.9	18.9		
								240	0.0	2.8	18.9		
300	0.0	2.4	18.9										
WS04	55	1.00 - 3.00	1.70	1013	0.0	0.0	13	15	0.0	3.5	14.4		
								30	0.0	3.7	13.8		
								60	0.0	3.8	13.5		
								90	0.0	3.8	13.4		
								120	0.0	3.8	13.4		
								180	0.0	3.8	13.4		
								240	0.0	3.8	13.4		
300	0.0	3.8	13.4										

GAS MONITORING DATA

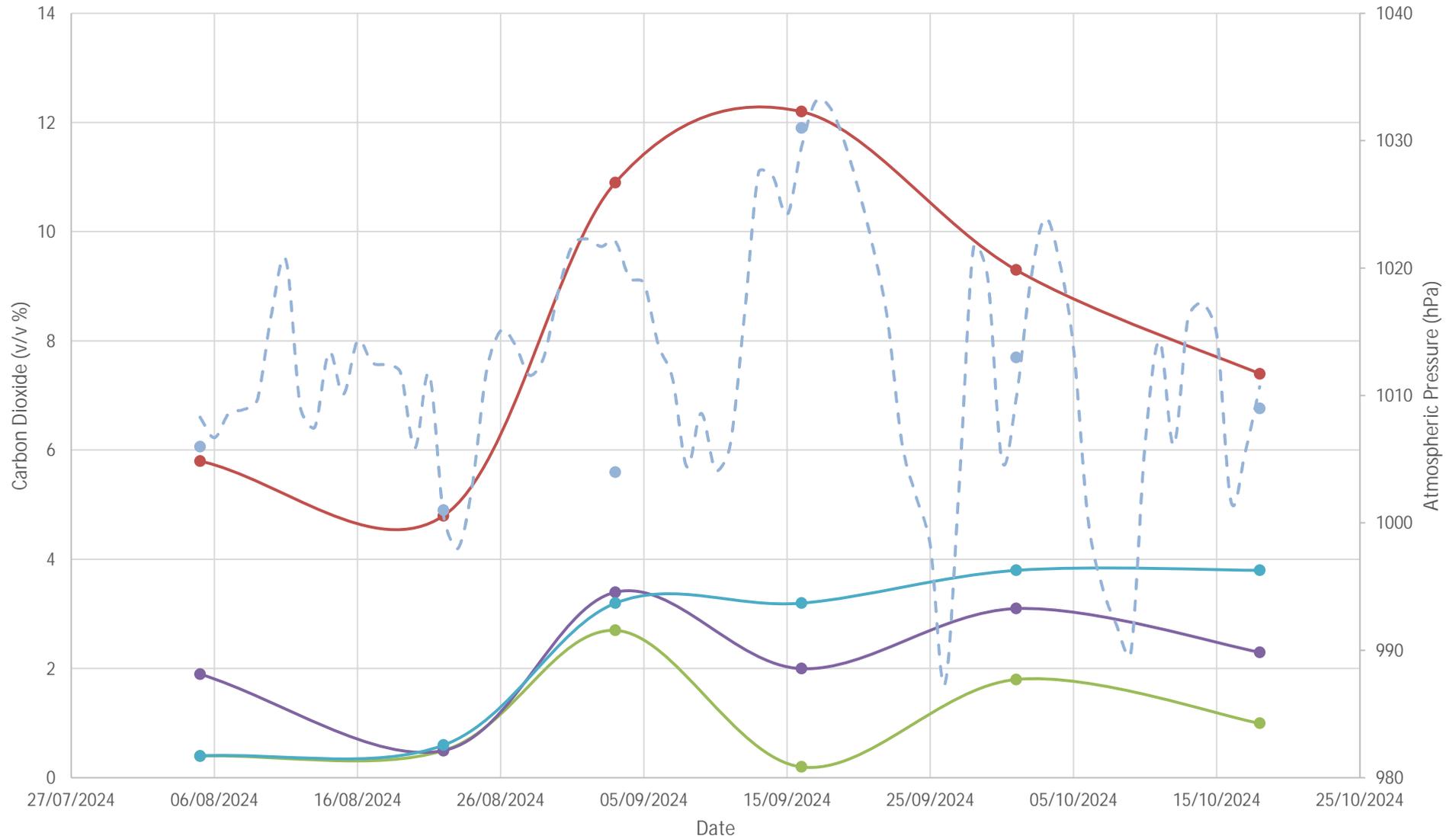


Site:	BKUK Barnsley		
Project:	M44628	Date:	18/10/2024

Operator:	LK
Weather:	Clear

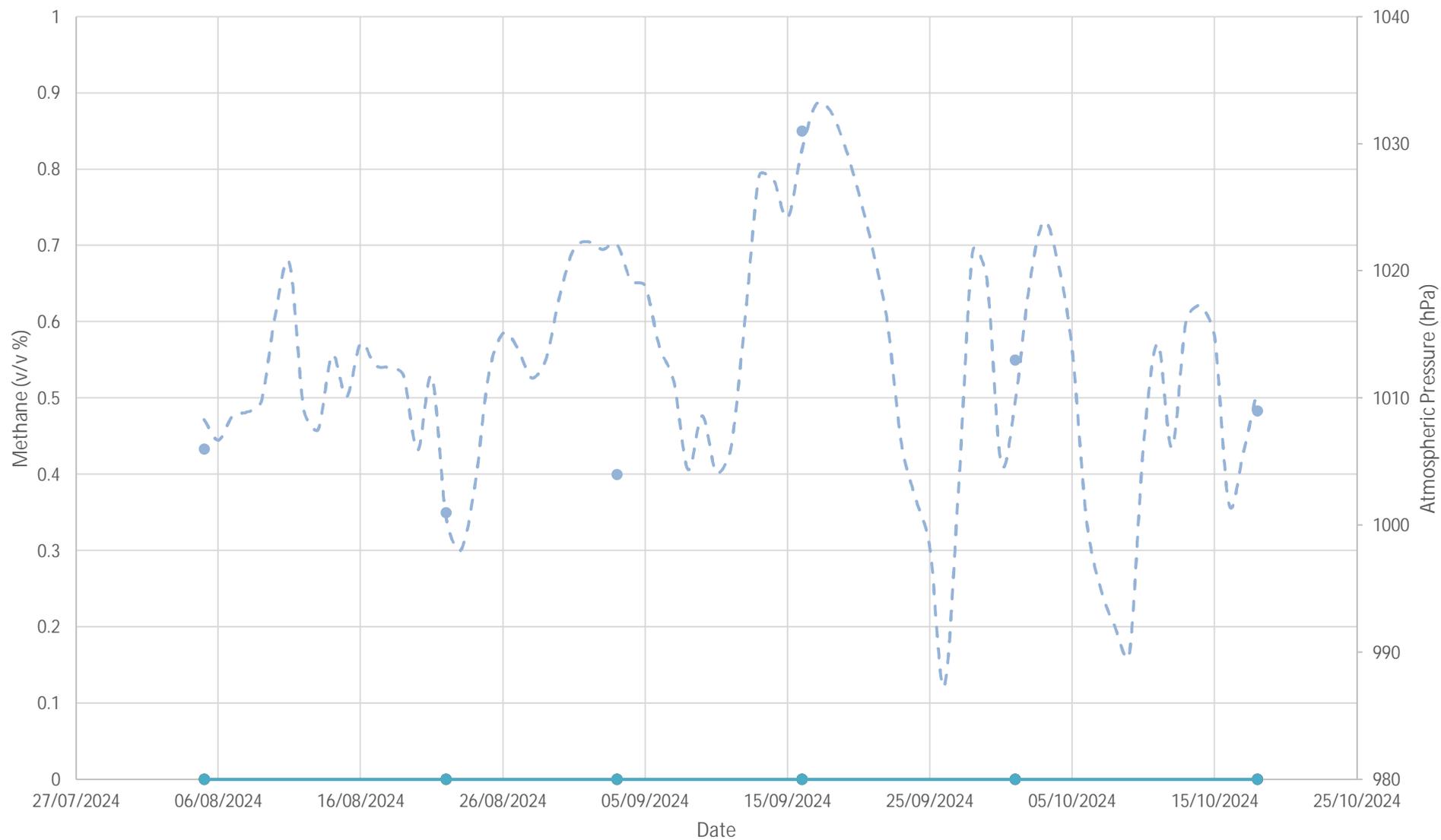
Monitoring Location	Standpipe diameter (mm)	Standpipe Depth (m bgl)	Water Level (m bgl)	Atmos. Pressure (mb)	Initial Flow Rate (litres/hr)	Average Flow Rate (litres/hr)	Temp (°C)	Reading Duration (s)	CH ₄ (% v/v)	CO ₂ (% v/v)	O ₂ (% v/v)	PID	Notes
WS01	55	1.00 - 3.00	1.65	1009	3.0	3.0	9	15	0.0	0.6	18.2		
								30	0.0	1.3	17.4		
								60	0.0	3.8	11.6		
								90	0.0	6.2	5.7		
								120	0.0	6.9	2.8		
								180	0.0	7.4	0.7		
								240	0.0	7.3	0.4		
300	0.0	6.9	0.6										
WS02	55	0.50 - 1.50	0.69	1009	0.0	0.0	9	15	0.0	1.0	19.1		Filter wet
								30	0.0	0.9	19.0		
								60	0.0	0.9	19.0		
								90	0.0	0.9	18.8		
								120	0.0	1.0	18.7		
								180	0.0	0.9	18.9		
								240	0.0	0.7	19.2		
300	0.0	0.7	19.3										
WS03	55	1.00 - 3.00	1.54	1009	0.0	0.0	9	15	0.0	0.6	20.7		
								30	0.0	1.3	20.1		
								60	0.0	1.9	19.3		
								90	0.0	2.2	18.9		
								120	0.0	2.3	18.7		
								180	0.0	2.3	18.6		
								240	0.0	2.2	18.6		
300	0.0	2.1	18.6										
WS04	55	1.00 - 3.00	1.47	1009	0.0	0.0	9	15	0.0	1.4	18.5		
								30	0.0	1.4	18.1		
								60	0.0	1.5	17.9		
								90	0.0	1.8	17.2		
								120	0.0	2.5	16.1		
								180	0.0	3.4	14.3		
								240	0.0	3.7	13.6		
300	0.0	3.8	13.3										
							360	0.0	3.8	13.7			

Carbon Dioxide Monitoring Trend



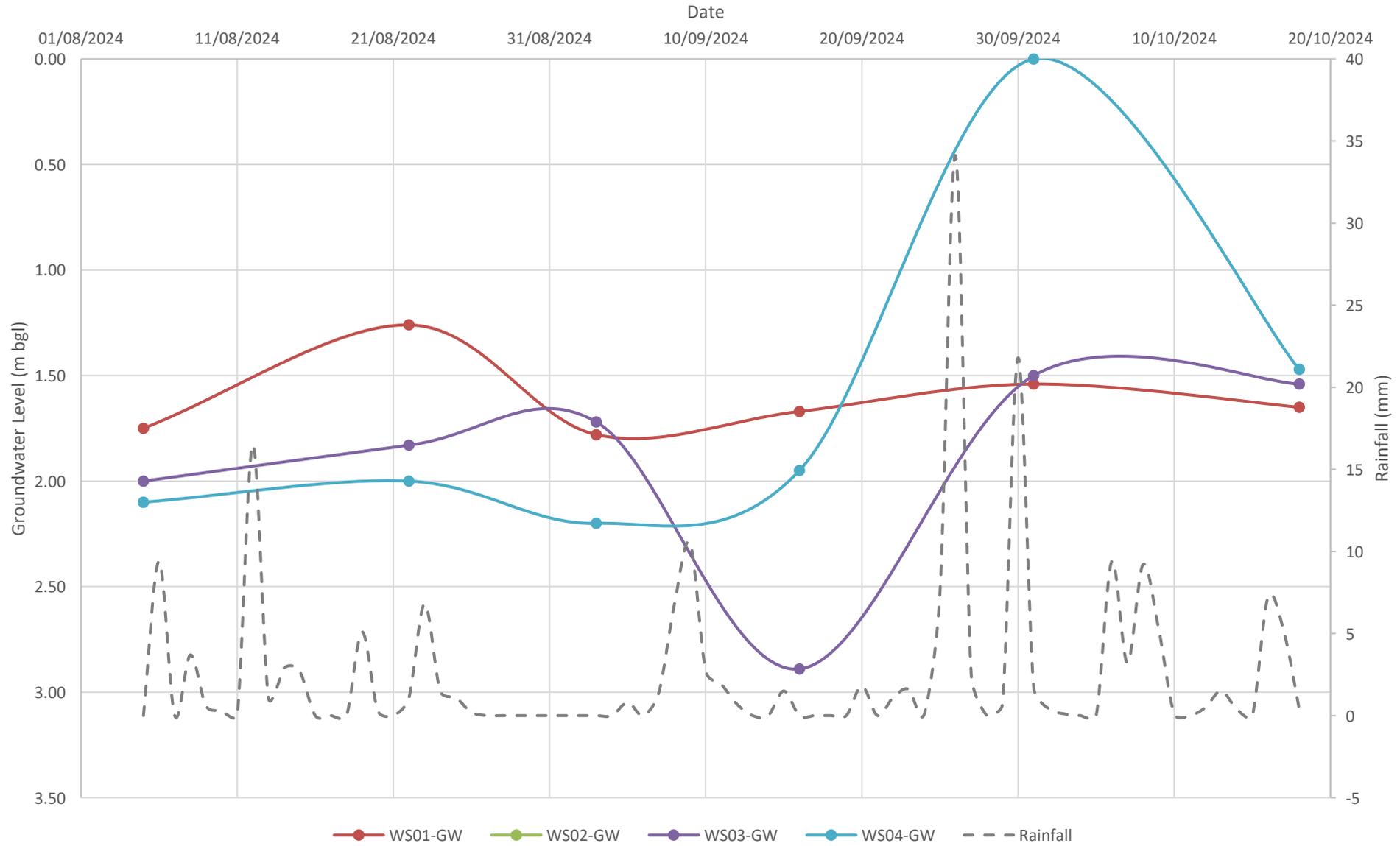
—●— WS01 —●— WS02 —●— WS03 —●— WS04 - - - Air Pressure ● Air Pressure at Visit Date

Methane Monitoring Trend



—●— WS01 —●— WS02 —●— WS03 —●— WS04 - - - Air Pressure ● Air Pressure at Visit Date

Groundwater Monitoring Trend



APPENDIX F: GEOTECHNICAL RESULTS

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS
 Tested in Accordance with: BS EN ISO 17892-12:2018+A2:2022,
 cl 5.3 and 5.5, Fall Cone Method, 4 Pt Test, BS 1377-2:2022,
 cl 5.2 and 6

i2 Analytical Ltd
 Unit 8 Harrowden Road
 Brackmills Industrial Estate
 Northampton NN4 7EB

Client: JNP Midlands LLP
 Client Address: No.1 Meadowhall, Riverside,
 Sheffield
 Contact: Leona Schofield
 Site Address: BKUK Barnsley

Client Reference: M44628
 Job Number: 24-033607-1
 Date Sampled: 29/07/2024
 Date Received: 30/07/2024
 Date Tested: 06/08/2024
 Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

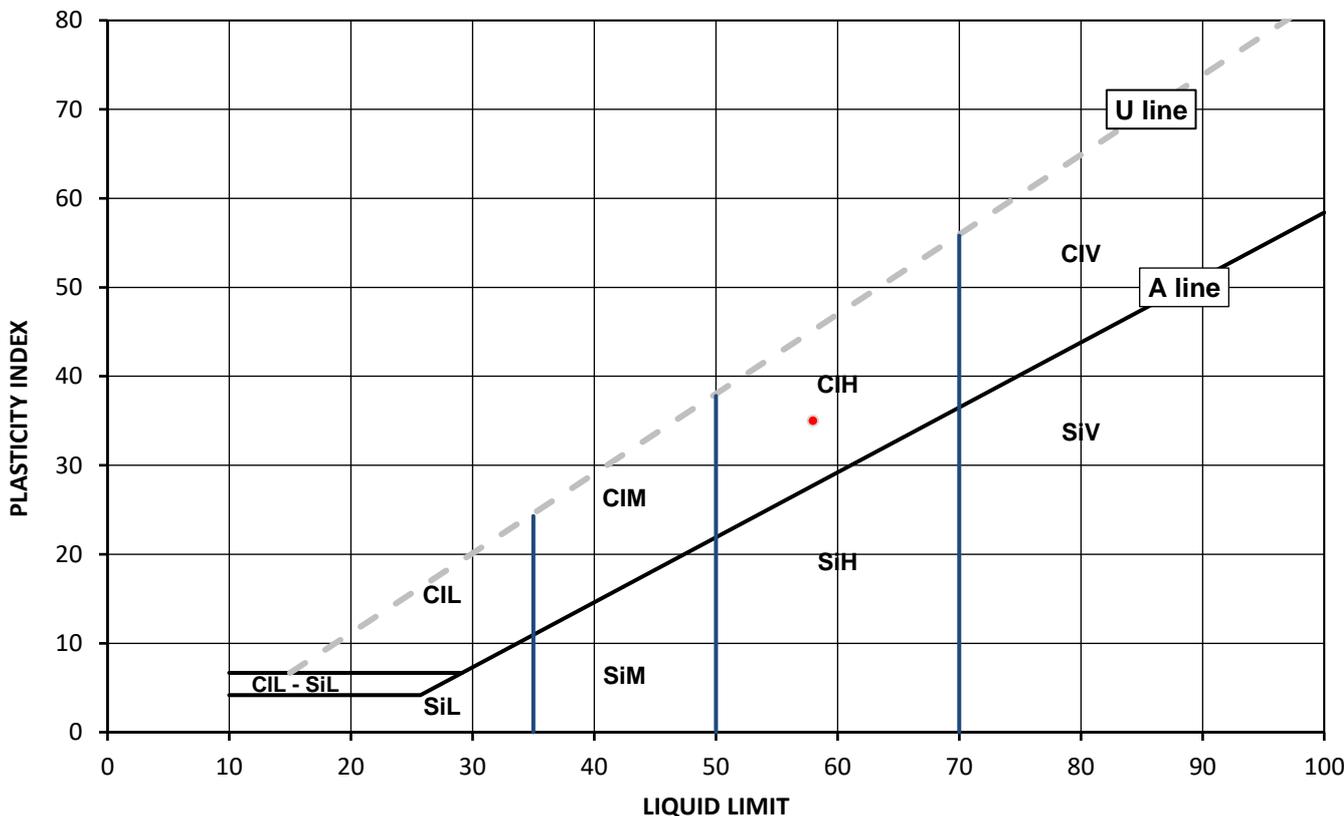
Test Results:

Laboratory Reference: 273087
 Hole No.: WS01
 Sample Reference: Not Given
 Sample Description: Brownish grey slightly sandy CLAY

Depth Top [m]: 1.20
 Depth Base [m]: Not Given
 Sample Type: D

Sample Preparation: Tested in natural condition; The water content in the sample was increased
 Cone Type: 80g/30deg

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
28.4	58	23	35	0.14	0.86	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

Cl	Clay	Plasticity	Liquid Limit
Si	Silt	L Low	below 35
		M Medium	35 to 50
		H High	50 to 70
		V Very high	exceeding 70
		O Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS EN 17892-1: 2014; # Non accredited

Remarks:

Signed:



Katarzyna Koziel
 Senior Reporting Specialist

for and on behalf of i2 Analytical Ltd

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS
 Tested in Accordance with: BS EN ISO 17892-12:2018+A2:2022,
 cl 5.3 and 5.5, Fall Cone Method, 4 Pt Test, BS 1377-2:2022,
 cl 5.2 and 6

i2 Analytical Ltd
 Unit 8 Harrowden Road
 Brackmills Industrial Estate
 Northampton NN4 7EB

Client: JNP Midlands LLP
 Client Address: No.1 Meadowhall, Riverside,
 Sheffield
 Contact: Leona Schofield
 Site Address: BKUK Barnsley

Client Reference: M44628
 Job Number: 24-033607-1
 Date Sampled: 29/07/2024
 Date Received: 30/07/2024
 Date Tested: 06/08/2024
 Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

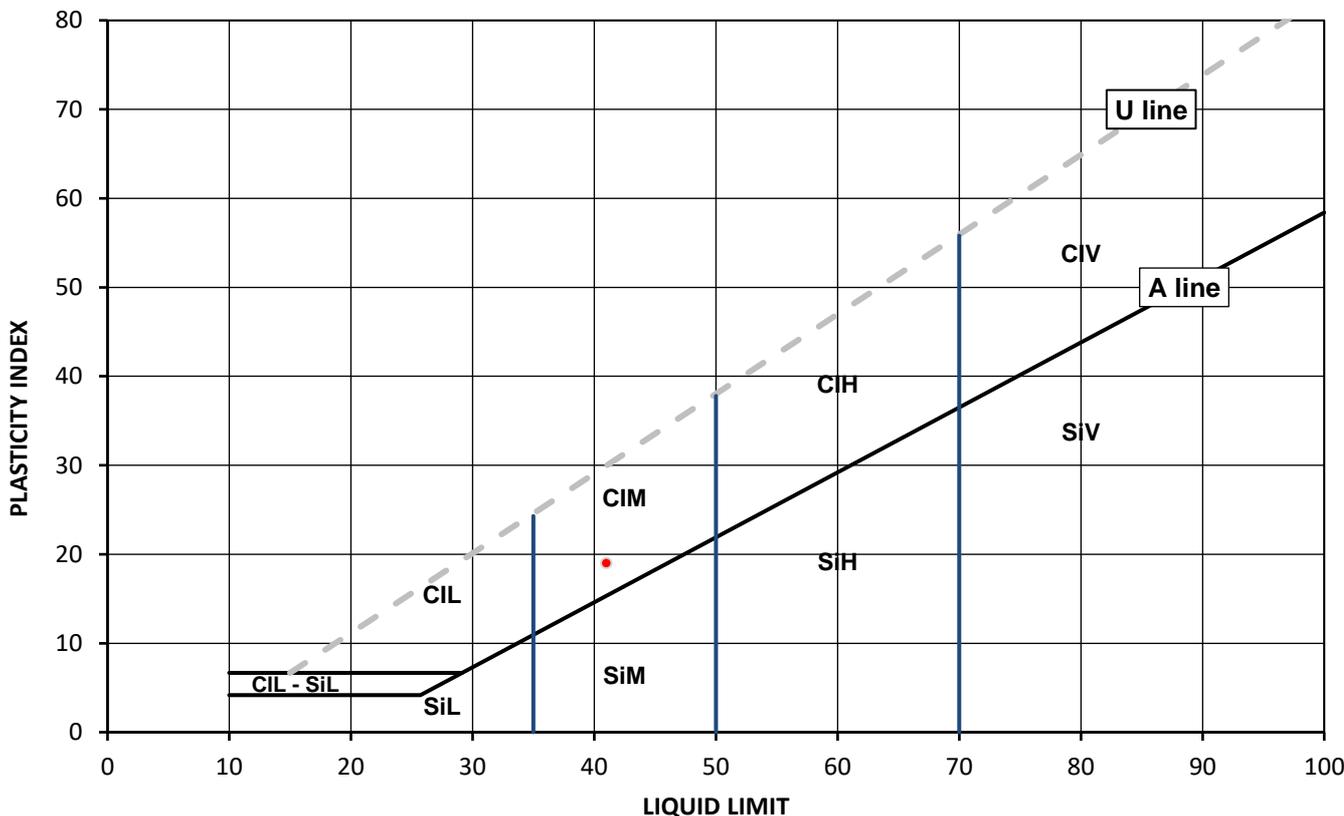
Test Results:

Laboratory Reference: 273088
 Hole No.: WS03
 Sample Reference: Not Given
 Sample Description: Brownish grey sandy CLAY

Depth Top [m]: 1.90
 Depth Base [m]: Not Given
 Sample Type: D

Sample Preparation: Tested in natural condition; The water content in the sample was increased
 Cone Type: 80g/30deg

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
19.0	41	22	19	-0.16	1.16	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

Cl	Clay	Plasticity	Liquid Limit
Si	Silt	L Low	below 35
		M Medium	35 to 50
		H High	50 to 70
		V Very high	exceeding 70
		O Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS EN 17892-1: 2014; # Non accredited

Remarks:

Signed:



Katarzyna Koziel
 Senior Reporting Specialist

for and on behalf of i2 Analytical Ltd

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS
 Tested in Accordance with: BS EN ISO 17892-12:2018+A2:2022,
 cl 5.3 and 5.5, Fall Cone Method, 4 Pt Test, BS 1377-2:2022,
 cl 5.2 and 6

i2 Analytical Ltd
 Unit 8 Harrowd Road
 Brackmills Industrial Estate
 Northampton NN4 7EB

Client: JNP Midlands LLP
 Client Address: No.1 Meadowhall, Riverside,
 Sheffield
 Contact: Leona Schofield
 Site Address: BKUK Barnsley

Client Reference: M44628
 Job Number: 24-033607-1
 Date Sampled: 29/07/2024
 Date Received: 30/07/2024
 Date Tested: 06/08/2024
 Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

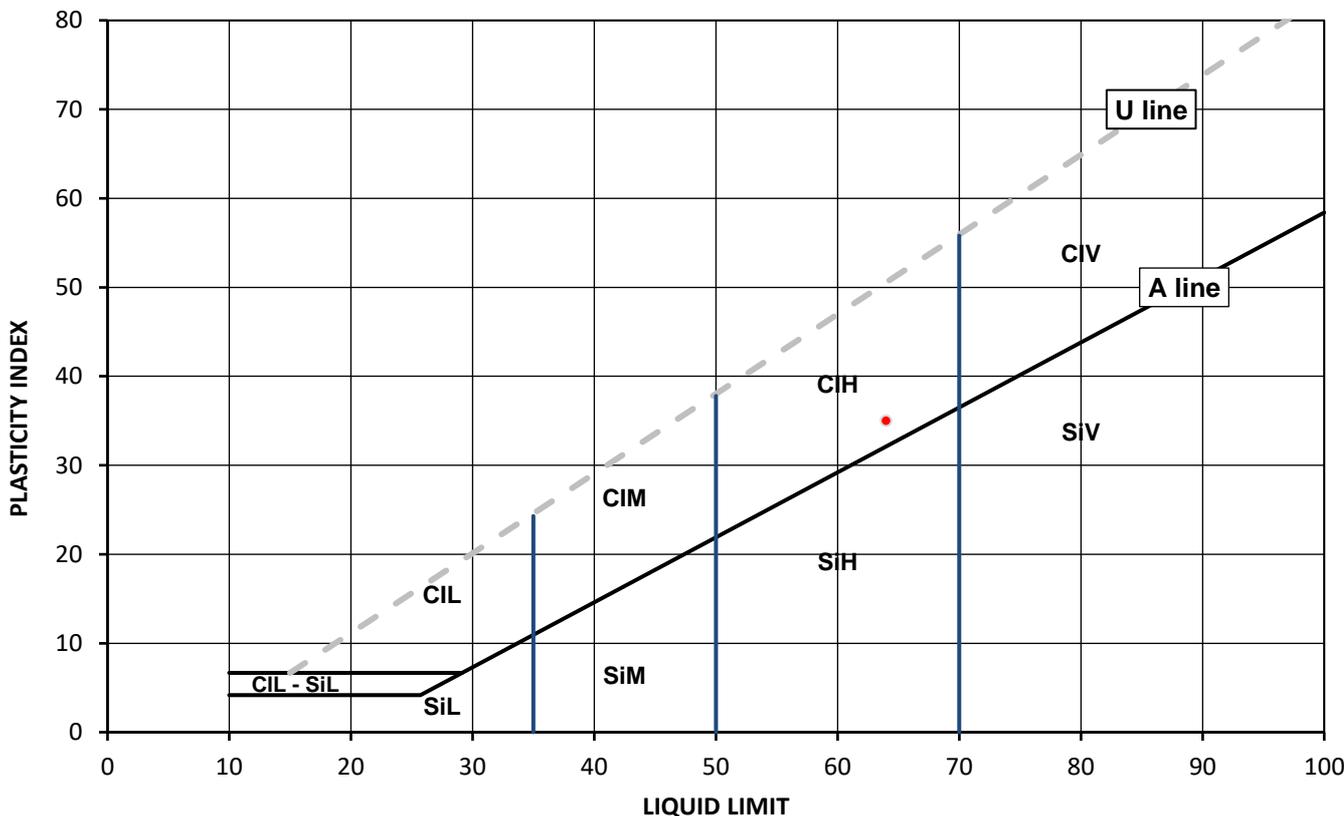
Test Results:

Laboratory Reference: 273089
 Hole No.: WS04
 Sample Reference: Not Given
 Sample Description: Brownish grey slightly gravelly CLAY

Depth Top [m]: 1.10
 Depth Base [m]: Not Given
 Sample Type: D

Sample Preparation: Tested after >0.425mm removed by hand; The water content in the sample was increased
 Cone Type: 80g/30deg

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
35.6	64	29	35	0.20	0.80	92



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

Cl	Clay	Plasticity	Liquid Limit
Si	Silt	L Low	below 35
		M Medium	35 to 50
		H High	50 to 70
		V Very high	exceeding 70
		O Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS EN 17892-1: 2014; # Non accredited

Remarks:

Signed:



Katarzyna Koziel
 Senior Reporting Specialist

for and on behalf of i2 Analytical Ltd

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.



4041

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS
 Tested in Accordance with: BS EN ISO 17892-12:2018+A2:2022,
 cl 5.3 and 5.5, Fall Cone Method, 4 Pt Test, BS 1377-2:2022,
 cl 5.2 and 6

i2 Analytical Ltd
 Unit 8 Harrowden Road
 Brackmills Industrial Estate
 Northampton NN4 7EB



Client: JNP Midlands LLP
 Client Address: No.1 Meadowhall, Riverside,
 Sheffield
 Contact: Leona Schofield
 Site Address: BKUK Barnsley

Client Reference: M44628
 Job Number: 24-033607-1
 Date Sampled: 29/07/2024
 Date Received: 30/07/2024
 Date Tested: 06/08/2024
 Sampled By: Not Given

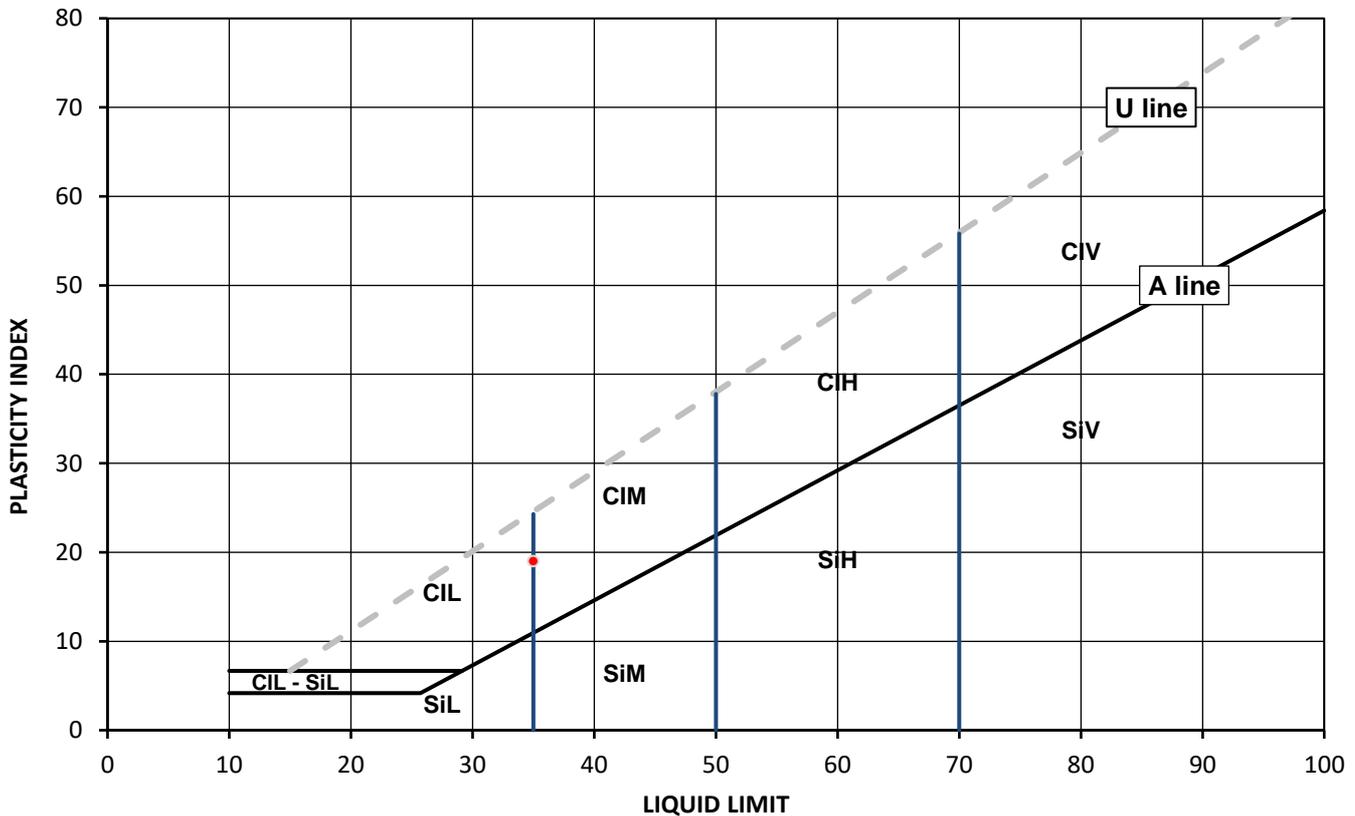
Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference: 273090
 Hole No.: WS04
 Sample Reference: Not Given
 Sample Description: Brownish grey sandy CLAY
 Sample Preparation: Tested in natural condition; The water content in the sample was increased
 Cone Type: 80g/30deg

Depth Top [m]: 2.20
 Depth Base [m]: Not Given
 Sample Type: D

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
16.4	35	16	19	0.00	1.00	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

Cl	Clay	P	Plasticity	L	Low	Liquid Limit	below 35
Si	Silt	M	Medium	H	High		35 to 50
		V	Very high	O	Organic		50 to 70
							exceeding 70
							append to classification for organic material (eg ClHO)

Note: Water Content by BS EN 17892-1: 2014; # Non accredited

Remarks:

Signed:

Katarzyna Koziel
 Senior Reporting Specialist

for and on behalf of i2 Analytical Ltd

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.



4041



SUMMARY REPORT
SUMMARY OF CLASSIFICATION TEST RESULTS

Tested in Accordance with:

i2 Analytical Ltd
 Unit 8 Harrowden Road
 Brackmills Industrial Estate
 Northampton NN4 7EB



Environmental Science

Client: JNP Midlands LLP
 Client Address: No.1 Meadowhall, Riverside,
 Sheffield

BS EN ISO 17892-12:2018+A2:2022 cl 5.3 and 5.5, Fall Cone Method, 4 Pt
 Test, BS 1377-2:2022, cl 5.2 and 6. W by BS EN ISO 17892-1:2014+A1:2022.

Client Reference: M44628
 Job Number: 24-033607-1
 Date Sampled: 29/07/2024
 Date Received: 30/07/2024
 Date Tested: 06/08/2024
 Sampled By: Not Given

Contact: Leona Schofield
 Site Address: BKUK Barnsley

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	W %	Liquid & Plastic Limit							Density		
		Reference	Depth Top	Depth Base	Type				% Passing 425um	WL*	Correlation Factor	Wp	Ip	Cone type	Sample Preparation	bulk	dry	PD
			m	m					%	%		%	%			%	Mg/m3	Mg/m3
273087	WS01	Not Given	1.20	Not Given	D	Brownish grey slightly sandy CLAY	Atterberg 4 Point	28.4	100	58	-	23	35	80g/30 deg	N / I			
273088	WS03	Not Given	1.90	Not Given	D	Brownish grey sandy CLAY	Atterberg 4 Point	19.0	100	41	-	22	19	80g/30 deg	N / I			
273089	WS04	Not Given	1.10	Not Given	D	Brownish grey slightly gravelly CLAY	Atterberg 4 Point	35.6	92	64	-	29	35	80g/30 deg	R / I			
273090	WS04	Not Given	2.20	Not Given	D	Brownish grey sandy CLAY	Atterberg 4 Point	16.4	100	35	-	16	19	80g/30 deg	N / I			

Note: # Non accredited; NP - Non plastic; N - Tested in natural condition, R - Tested after >0,425mm removed by hand, W - Tested after washing to remove >425mm; I - The water content in the sample was increased, D - The water content in the sample was decreased; * - One point liquid limit corrected as per the report Correlation Factor by Clayton C.R.I and Jukes A.W (1978)

Comments:

Signed:

Katarzyna Koziel
 Senior Reporting Specialist

for and on behalf of i2 Analytical Ltd

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.



4041

SUMMARY REPORT

DETERMINATION OF WATER CONTENT

Tested in Accordance with: BS EN ISO 17892-1:2014+A1:2022, BS 1377-2: 2022, clause 4.1

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB



Environmental Science

Client: JNP Midlands LLP
Client Address: No.1 Meadowhall, Riverside,
Sheffield

Contact: Leona Schofield
Site Address: BKUK Barnsley

Client Reference: M44628
Job Number: 24-033607-1
Date Sampled: 29/07/2024
Date Received: 30/07/2024
Date Tested: 06/08/2024
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	WC														
		Reference	Depth Top m	Depth Base m	Type																	
273087	WS01	Not Given	1.20	Not Given	D	Brownish grey slightly sandy CLAY	28.4															
273088	WS03	Not Given	1.90	Not Given	D	Brownish grey sandy CLAY	19.0															
273089	WS04	Not Given	1.10	Not Given	D	Brownish grey slightly gravelly CLAY	35.6															
273090	WS04	Not Given	2.20	Not Given	D	Brownish grey sandy CLAY	16.4															

Comments:

Signed:

Katarzyna Koziel
Senior Reporting Specialist

for and on behalf of i2 Analytical Ltd

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

APPENDIX G: CHEMICAL TEST RESULTS



JNP Midlands LLP
No.1 Meadowhall
Riverside
Sheffield

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

e: leona.schofield@jnpgroup.co.uk

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 24-033567

Project / Site name:	BKUK Barnsley	Samples received on:	30/07/2024
Your job number:	M44628	Samples instructed on/ Analysis started on:	30/07/2024
Your order number:	GO3267	Analysis completed by:	07/08/2024
Report Issue Number:	1	Report issued on:	07/08/2024
Samples Analysed:	10 soil samples - 3 leachate samples		

Signed: 

Dominika Liana
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 24-033567
 Project / Site name: BKUK Barnsley
 Your Order No: GO3267

Lab Sample Number	272781			272782			272783			272784			272785		
Sample Reference	WS01			WS01			WS02			WS02			WS03		
Sample Number	None Supplied			None Supplied			None Supplied			None Supplied			None Supplied		
Depth (m)	0.45			1.20			0.50			1.50			0.30		
Date Sampled	29/07/2024			29/07/2024			29/07/2024			29/07/2024			29/07/2024		
Time Taken	None Supplied			None Supplied			None Supplied			None Supplied			None Supplied		
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status												

Parameter	Units	Test Limit of detection	Test Accreditation Status	272781	272782	272783	272784	272785
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	8	20	12	17	7.6
Total mass of sample received	kg	0.1	NONE	0.3	0.3	0.4	0.4	0.4

Asbestos

Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Not-detected	-	Not-detected	-	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	MBI	-	MBI	-	MBI

General Inorganics

Parameter	pH Units	N/A	MCERTS	272781	272782	272783	272784	272785
pH (L099)				8.9	-	8.9	5.9	8.9
Total Sulphate as SO ₄	%	0.005	MCERTS	0.033	-	-	0.12	-
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	70	-	-	520	-
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	34.8	-	-	258	-
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	12	-	-	3.6	-
Total Sulphur	mg/kg	50	MCERTS	170	-	-	390	-
Total Sulphur	%	0.005	MCERTS	0.017	-	-	0.039	-
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	0.5	-	3.4	-	0.1
Water Soluble Nitrate (2:1) as N	mg/kg	2	NONE	< 2.0	-	-	< 2.0	-
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	-	-	< 2.0	-

Speciated PAHs

Parameter	mg/kg	0.05	MCERTS	272781	272782	272783	272784	272785
Naphthalene	mg/kg	0.05	MCERTS	0.08	< 0.05	0.78	-	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	-	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.05	-	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	-	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.14	< 0.05	0.72	-	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.18	-	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	0.11	< 0.05	0.9	-	< 0.05
Pyrene	mg/kg	0.05	MCERTS	0.11	< 0.05	0.83	-	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.06	< 0.05	0.52	-	< 0.05
Chrysene	mg/kg	0.05	MCERTS	0.06	< 0.05	0.51	-	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	< 0.05	0.75	-	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	< 0.05	0.26	-	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.56	-	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.35	-	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	-	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.41	-	< 0.05

Total PAH

Parameter	mg/kg	0.8	ISO 17025	272781	272782	272783	272784	272785
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	< 0.80	< 0.80	6.81	-	< 0.80

Analytical Report Number: 24-033567
 Project / Site name: BKUK Barnsley
 Your Order No: GO3267

Lab Sample Number	272781		272782		272783		272784		272785	
Sample Reference	WS01		WS01		WS02		WS02		WS03	
Sample Number	None Supplied		None Supplied		None Supplied		None Supplied		None Supplied	
Depth (m)	0.45		1.20		0.50		1.50		0.30	
Date Sampled	29/07/2024		29/07/2024		29/07/2024		29/07/2024		29/07/2024	
Time Taken	None Supplied		None Supplied		None Supplied		None Supplied		None Supplied	
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status							

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	1.9	13	18	-	1.1
Barium (aqua regia extractable)	mg/kg	1	MCERTS	27	100	250	-	15
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.22	1.2	3.7	-	0.09
Boron (water soluble)	mg/kg	0.2	MCERTS	0.4	0.2	0.6	-	0.3
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.3	< 0.2	< 0.2	-	0.4
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	7.8	39	21	-	5.3
Copper (aqua regia extractable)	mg/kg	1	MCERTS	7.1	31	86	-	3.1
Lead (aqua regia extractable)	mg/kg	1	MCERTS	25	17	32	-	14
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	-	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	4.1	32	28	-	2.2
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	1	< 1.0	1.9	-	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	9.3	39	58	-	4.2
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	65	62	71	-	66

Magnesium (leachate equivalent)	mg/l	2.5	NONE	16	-	-	36	-
---------------------------------	------	-----	------	----	---	---	----	---

Petroleum Hydrocarbons

TPHCWG - Aliphatic >EC5 - EC6 _{HS_1D_AL}	mg/kg	0.01	MCERTS	-	< 0.010	-	-	-
TPHCWG - Aliphatic >EC6 - EC8 _{HS_1D_AL}	mg/kg	0.01	MCERTS	-	< 0.010	-	-	-
TPHCWG - Aliphatic >EC8 - EC10 _{HS_1D_AL}	mg/kg	0.01	MCERTS	-	< 0.010	-	-	-
TPHCWG - Aliphatic >EC10 - EC12 _{EH_CU_1D_AL}	mg/kg	1	MCERTS	-	< 1.0	-	-	-
TPHCWG - Aliphatic >EC12 - EC16 _{EH_CU_1D_AL}	mg/kg	2	MCERTS	-	< 2.0	-	-	-
TPHCWG - Aliphatic >EC16 - EC21 _{EH_CU_1D_AL}	mg/kg	8	MCERTS	-	< 8.0	-	-	-
TPHCWG - Aliphatic >EC21 - EC35 _{EH_CU_1D_AL}	mg/kg	8	MCERTS	-	< 8.0	-	-	-
TPHCWG - Aliphatic >EC5 - EC35 _{EH_CU+HS_1D_AL}	mg/kg	10	NONE	-	< 10	-	-	-

TPHCWG - Aromatic >EC5 - EC7 _{HS_1D_AR}	mg/kg	0.01	MCERTS	-	< 0.010	-	-	-
TPHCWG - Aromatic >EC7 - EC8 _{HS_1D_AR}	mg/kg	0.01	MCERTS	-	< 0.010	-	-	-
TPHCWG - Aromatic >EC8 - EC10 _{HS_1D_AR}	mg/kg	0.02	MCERTS	-	< 0.020	-	-	-
TPHCWG - Aromatic >EC10 - EC12 _{EH_CU_1D_AR}	mg/kg	1	MCERTS	-	< 1.0	-	-	-
TPHCWG - Aromatic >EC12 - EC16 _{EH_CU_1D_AR}	mg/kg	2	MCERTS	-	< 2.0	-	-	-
TPHCWG - Aromatic >EC16 - EC21 _{EH_CU_1D_AR}	mg/kg	10	MCERTS	-	< 10	-	-	-
TPHCWG - Aromatic >EC21 - EC35 _{EH_CU_1D_AR}	mg/kg	10	MCERTS	-	< 10	-	-	-
TPHCWG - Aromatic >EC5 - EC35 _{EH_CU+HS_1D_AR}	mg/kg	10	NONE	-	< 10	-	-	-

Petroleum Range Organics (EC6 - EC10) _{HS_1D_TOTAL}	mg/kg	1	ISO 17025	< 1.0	-	-	-	< 1.0
TPH (EC10 - EC25) _{EH_CU_1D_TOTAL}	mg/kg	10	MCERTS	< 10	-	-	-	< 10
TPH (EC25 - EC40) _{EH_CU_1D_TOTAL}	mg/kg	10	MCERTS	120	-	-	-	< 10

VOCs

MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	-	< 5.0	-	-	-
Benzene	µg/kg	5	MCERTS	-	< 5.0	-	-	-
Toluene	µg/kg	5	MCERTS	-	< 5.0	-	-	-
Ethylbenzene	µg/kg	5	MCERTS	-	< 5.0	-	-	-
p & m-Xylene	µg/kg	5	MCERTS	-	< 5.0	-	-	-
o-Xylene	µg/kg	5	MCERTS	-	< 5.0	-	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number: 24-033567
 Project / Site name: BKUK Barnsley
 Your Order No: GO3267

Lab Sample Number	272786			272787			272788			272789			272790		
Sample Reference	WS03			WS04			WS04			WS05			WS05		
Sample Number	None Supplied			None Supplied			None Supplied			None Supplied			None Supplied		
Depth (m)	0.70			0.20			0.60			0.15			1.30		
Date Sampled	29/07/2024			29/07/2024			29/07/2024			29/07/2024			29/07/2024		
Time Taken	None Supplied			None Supplied			None Supplied			None Supplied			None Supplied		
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status												

Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	7.2	8.4	22	9.1	18
Total mass of sample received	kg	0.1	NONE	0.4	0.4	0.3	0.3	0.4

Asbestos

Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Not-detected	Not-detected	-	Not-detected	-
Asbestos Analyst ID	N/A	N/A	N/A	MBI	MBI	-	MBI	-

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	10.7	9.6	7.9	10.1	5.3
Total Sulphate as SO ₄	%	0.005	MCERTS	0.307	-	-	-	0.077
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	900	-	-	-	190
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	452	-	-	-	94.9
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	130	-	-	-	7.8
Total Sulphur	mg/kg	50	MCERTS	4000	-	-	-	290
Total Sulphur	%	0.005	MCERTS	0.396	-	-	-	0.029
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	-	0.1	1.3	0.1	-
Water Soluble Nitrate (2:1) as N	mg/kg	2	NONE	< 2.0	-	-	-	< 2.0
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	-	-	-	< 2.0

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	-	< 0.05	< 0.05	< 0.05	-
Acenaphthylene	mg/kg	0.05	MCERTS	-	< 0.05	< 0.05	< 0.05	-
Acenaphthene	mg/kg	0.05	MCERTS	-	< 0.05	< 0.05	< 0.05	-
Fluorene	mg/kg	0.05	MCERTS	-	< 0.05	< 0.05	< 0.05	-
Phenanthrene	mg/kg	0.05	MCERTS	-	< 0.05	0.05	< 0.05	-
Anthracene	mg/kg	0.05	MCERTS	-	< 0.05	< 0.05	< 0.05	-
Fluoranthene	mg/kg	0.05	MCERTS	-	0.05	0.06	< 0.05	-
Pyrene	mg/kg	0.05	MCERTS	-	0.06	0.05	< 0.05	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	< 0.05	< 0.05	< 0.05	-
Chrysene	mg/kg	0.05	MCERTS	-	< 0.05	< 0.05	< 0.05	-
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	-	< 0.05	< 0.05	< 0.05	-
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	-	< 0.05	< 0.05	< 0.05	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	< 0.05	< 0.05	< 0.05	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	< 0.05	< 0.05	< 0.05	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	< 0.05	< 0.05	< 0.05	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	< 0.05	< 0.05	< 0.05	-

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	-	< 0.80	< 0.80	< 0.80	-
-----------------------------	-------	-----	-----------	---	--------	--------	--------	---

Analytical Report Number: 24-033567
 Project / Site name: BKUK Barnsley
 Your Order No: GO3267

Lab Sample Number	272786		272787		272788		272789		272790	
Sample Reference	WS03		WS04		WS04		WS05		WS05	
Sample Number	None Supplied		None Supplied		None Supplied		None Supplied		None Supplied	
Depth (m)	0.70		0.20		0.60		0.15		1.30	
Date Sampled	29/07/2024		29/07/2024		29/07/2024		29/07/2024		29/07/2024	
Time Taken	None Supplied		None Supplied		None Supplied		None Supplied		None Supplied	
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status							

Heavy Metals / Metalloids

Element	Units	Test Limit of detection	Test Accreditation Status	272786	272787	272788	272789	272790
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	-	1.8	9.5	1.7	-
Barium (aqua regia extractable)	mg/kg	1	MCERTS	-	18	140	20	-
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	-	0.1	1.4	0.29	-
Boron (water soluble)	mg/kg	0.2	MCERTS	-	0.2	0.3	0.6	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	-	0.2	< 0.2	0.3	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-	14	34	5.4	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	-	6.9	20	4.5	-
Lead (aqua regia extractable)	mg/kg	1	MCERTS	-	7.4	23	8.2	-
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	-	< 0.3	< 0.3	< 0.3	-
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	-	3	30	2.1	-
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	-	< 1.0	2.1	< 1.0	-
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	-	5.9	42	4.7	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	-	24	90	60	-

Magnesium (leachate equivalent)	mg/l	2.5	NONE	< 2.5	-	-	-	11
---------------------------------	------	-----	------	-------	---	---	---	----

Petroleum Hydrocarbons

Parameter	Units	Test Limit of detection	Test Accreditation Status	272786	272787	272788	272789	272790
TPHCWG - Aliphatic >EC5 - EC6 _{HS_1D_AL}	mg/kg	0.01	MCERTS	-	-	< 0.010	-	-
TPHCWG - Aliphatic >EC6 - EC8 _{HS_1D_AL}	mg/kg	0.01	MCERTS	-	-	< 0.010	-	-
TPHCWG - Aliphatic >EC8 - EC10 _{HS_1D_AL}	mg/kg	0.01	MCERTS	-	-	< 0.010	-	-
TPHCWG - Aliphatic >EC10 - EC12 _{EH_CU_1D_AL}	mg/kg	1	MCERTS	-	-	< 1.0	-	-
TPHCWG - Aliphatic >EC12 - EC16 _{EH_CU_1D_AL}	mg/kg	2	MCERTS	-	-	< 2.0	-	-
TPHCWG - Aliphatic >EC16 - EC21 _{EH_CU_1D_AL}	mg/kg	8	MCERTS	-	-	< 8.0	-	-
TPHCWG - Aliphatic >EC21 - EC35 _{EH_CU_1D_AL}	mg/kg	8	MCERTS	-	-	< 8.0	-	-
TPHCWG - Aliphatic >EC5 - EC35 _{EH_CU+HS_1D_AL}	mg/kg	10	NONE	-	-	< 10	-	-

TPHCWG - Aromatic >EC5 - EC7 _{HS_1D_AR}	mg/kg	0.01	MCERTS	-	-	< 0.010	-	-
TPHCWG - Aromatic >EC7 - EC8 _{HS_1D_AR}	mg/kg	0.01	MCERTS	-	-	< 0.010	-	-
TPHCWG - Aromatic >EC8 - EC10 _{HS_1D_AR}	mg/kg	0.02	MCERTS	-	-	< 0.020	-	-
TPHCWG - Aromatic >EC10 - EC12 _{EH_CU_1D_AR}	mg/kg	1	MCERTS	-	-	< 1.0	-	-
TPHCWG - Aromatic >EC12 - EC16 _{EH_CU_1D_AR}	mg/kg	2	MCERTS	-	-	< 2.0	-	-
TPHCWG - Aromatic >EC16 - EC21 _{EH_CU_1D_AR}	mg/kg	10	MCERTS	-	-	< 10	-	-
TPHCWG - Aromatic >EC21 - EC35 _{EH_CU_1D_AR}	mg/kg	10	MCERTS	-	-	< 10	-	-
TPHCWG - Aromatic >EC5 - EC35 _{EH_CU+HS_1D_AR}	mg/kg	10	NONE	-	-	< 10	-	-

Petroleum Range Organics (EC6 - EC10) _{HS_1D_TOTAL}	mg/kg	1	ISO 17025	-	-	-	< 1.0	-
TPH (EC10 - EC25) _{EH_CU_1D_TOTAL}	mg/kg	10	MCERTS	-	-	-	< 10	-
TPH (EC25 - EC40) _{EH_CU_1D_TOTAL}	mg/kg	10	MCERTS	-	-	-	< 10	-

VOCs

Parameter	Units	Test Limit of detection	Test Accreditation Status	272786	272787	272788	272789	272790
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	-	-	< 5.0	-	-
Benzene	µg/kg	5	MCERTS	-	-	< 5.0	-	-
Toluene	µg/kg	5	MCERTS	-	-	< 5.0	-	-
Ethylbenzene	µg/kg	5	MCERTS	-	-	< 5.0	-	-
p & m-Xylene	µg/kg	5	MCERTS	-	-	< 5.0	-	-
o-Xylene	µg/kg	5	MCERTS	-	-	< 5.0	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number: 24-033567

Project / Site name: BKUK Barnsley

Your Order No: G03267

Lab Sample Number	272781			272783			272785		
Sample Reference	WS01			WS02			WS03		
Sample Number	None Supplied			None Supplied			None Supplied		
Depth (m)	0.45			0.50			0.30		
Date Sampled	29/07/2024			29/07/2024			29/07/2024		
Time Taken	None Supplied			None Supplied			None Supplied		
Analytical Parameter (Leachate Analysis)	Units	Test Limit of detection	Test Accreditation Status						

General Inorganics

Parameter	Units	Test Limit of detection	Test Accreditation Status	272781	272783	272785
pH (automated)	pH Units	N/A	ISO 17025	8.9	-	-
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	5.7	-	-
Hardness - Total	mgCaCO ₃ /l	1	ISO 17025	73.3	-	-

Heavy Metals / Metalloids

Parameter	Units	Test Limit of detection	Test Accreditation Status	272781	272783	272785
Arsenic (dissolved)	µg/l	1	ISO 17025	3.4	3.9	3.3
Barium (dissolved)	µg/l	0.05	ISO 17025	32	47	24
Beryllium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2	< 0.2
Boron (dissolved)	µg/l	10	ISO 17025	57	95	55
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08	0.16	< 0.08
Chromium (dissolved)	µg/l	0.4	ISO 17025	1.6	2.6	1.6
Copper (dissolved)	µg/l	0.7	ISO 17025	34	86	43
Lead (dissolved)	µg/l	1	ISO 17025	2.6	4.4	4.3
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5	< 0.5
Nickel (dissolved)	µg/l	0.3	ISO 17025	1.1	3.5	< 0.3
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0	< 4.0	< 4.0
Vanadium (dissolved)	µg/l	1.7	ISO 17025	5.1	< 1.7	< 1.7
Zinc (dissolved)	µg/l	0.4	ISO 17025	11	61	28

Calcium (dissolved)	mg/l	0.012	ISO 17025	21	-	-
---------------------	------	-------	-----------	----	---	---

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number : 24-033567

Project / Site name: BKUK Barnsley

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
272781	WS01	None Supplied	0.45	Brown clay and sand with gravel
272782	WS01	None Supplied	1.2	Brown clay and sand with gravel
272783	WS02	None Supplied	0.5	Brown loam and clay with gravel
272784	WS02	None Supplied	1.5	Brown clay and sand with gravel
272785	WS03	None Supplied	0.3	Brown clay and sand with gravel
272786	WS03	None Supplied	0.7	Brown loam and clay with gravel
272787	WS04	None Supplied	0.2	Brown clay and sand with gravel
272788	WS04	None Supplied	0.6	Brown loam and clay with gravel
272789	WS05	None Supplied	0.15	Brown clay and sand with gravel
272790	WS05	None Supplied	1.3	Brown clay and sand with gravel

Analytical Report Number : 24-033567

Project / Site name: BKUK Barnsley

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in Soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques	In-house method based on HSG 248, 2021	A001B	D	ISO 17025
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate (Walkley Black Method)	In-house method	L009B	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically (up to 30°C)	In-house method	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
Dissolved Organic Carbon in leachate	Determination of dissolved organic carbon in leachate by the measurement on a non-dispersive infrared analyser of carbon dioxide released by acidification	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037B	W	NONE
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L038B	D	MCERTS
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES	In-house method based on Second Site Properties version 3	L038B	D	MCERTS
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES	In-house method based on TRL 447	L038B	D	NONE
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES	In-house method	L038B	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Sulphate, water soluble, in soil (16hr extraction)	In-house method	L038B	D	MCERTS
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES	In-house method	L038B	D	MCERTS
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L039B	W	ISO 17025
Total Hardness of leachates	Determination of hardness in leachates by calculation from calcium and magnesium	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045B	W	ISO 17025
Speciated PAHs and/or Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds (including PAH) in soil by extraction in dichloromethane and hexane followed by GC-MS	In-house method based on USEPA 8270	L064B	D	MCERTS
BTEX and/or Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS	In-house method based on USEPA 8260	L073B	W	MCERTS
Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil	Determination of total petroleum hydrocarbons in soil by GC-FID/GC-MS HS with carbon banding aliphatic and aromatic	In-house method	L076B/L088	D/W	MCERTS

Analytical Report Number : 24-033567

Project / Site name: BKUK Barnsley

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Total petroleum hydrocarbons by GC-FID/GC-MS HS in soil	Determination of total petroleum hydrocarbons in soil by GC-FID/GC-MS HS	In-house method	L076B/L088	D/W	MCERTS
Water Soluble Nitrate (2:1) as N in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08, 2:1 extraction	L078B	W	NONE
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser	In-house method	L082B	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement	In-house method	L099	D	MCERTS
pH at 20°C in leachate (automated)	Determination of pH in leachate by electrometric measurement	In-house method	L099	W	ISO 17025

For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL' or 'B' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

Quality control parameter failure associated with individual result applies to calculated sum of individuals.

The result for sum should be interpreted with caution



JNP GROUP

CONSULTING ENGINEERS

Amersham (HQ)

Sycamore House
1 Woodside Road
Amersham
Buckinghamshire
HP6 6AA

telephone

01494 771221

more info

www.jnpgroup.co.uk/contact

Hartlepool

The Innovation Centre
Venture Court
Queens Meadow Business Park
Hartlepool
TS25 5TG

telephone

01429 800711

more info

www.jnpgroup.co.uk/contact

Brighouse

Woodvale House
Woodvale Road
Brighouse
West Yorkshire
HD6 4AB

telephone

01484 400691

more info

www.jnpgroup.co.uk/contact

Sheffield

MBP2 Meadowhall Business Park
Carbrook Hall Road
Sheffield
South Yorkshire
S9 2EQ

telephone

0114 244 3500

more info

www.jnpgroup.co.uk/contact

Bristol

Whitefriars,
Lewins Mead,
Bristol

BS1 2NT

telephone

01174 721705

more info

www.jnpgroup.co.uk/contact

Warwick

Portobello House
Portobello Way
Warwick
Warwickshire
CV34 5GJ

telephone

01926 889955

more info

www.jnpgroup.co.uk/contact

Glasgow

Clydesdale House
300 Springhill Parkway
Glasgow Business Park
Baillieston, Glasgow
G69 6GA

telephone

0141 378 0808

more info

www.jnpgroup.co.uk/contact