



Interpretative Geotechnical Investigation Report

Parkside, Hoyland Common, Barnsley

February 2024




Waterman Infrastructure & Environment Limited

5th Floor, One Cornwall Street, Birmingham, B3 2DX
www.watermangroup.com

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Issue	Date	Prepared by	Checked by	Approved by
01	February 2024	Ryan Panter Senior Engineer 	Andrew Tomlinson Senior Engineer 	Phil Edge Associate Director 

Comments

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Executive Summary

Objectives

Waterman Infrastructure and Environment Limited was instructed by Barnsley MBC (“the client”) to undertake a Interpretative Geotechnical Investigation Report at the site.

Site Setting

Current Use The site is currently a grassed, vacant plot of land, with a metal palisade fence around the perimeter. The site generally slopes down from 137mAOD at the western access point off Sheffield Road, down to the southeastern corner at 126mAOD.

It is noted that a turfed pitch has been constructed along the southern boundary, with 2 No. drainage ditches infilled with granular material.

Coal Mining The Pennine Middle Coal Measures has a regional dip of between 3 and 4 degrees to the north-east in this area. The Dunsil (Harley) Coal seam is shown to outcrop on the site, trending approximately north-west – south-east. The underlying Gawber Coal and Swallow Wood Coal seams are expected to dip below the site. The bedrock in the general area appears to have been moderately faulted, with two unnamed inferred faults mapped near to, and may encroach onto, the site. These are to the north-west and south-west of the site, downthrown to the south-east and south-west respectively.

The Coal Authority Consultants Coal Mining Report notes the Site is predominantly located in a Development High Risk Area, relating to the historical opencast coal mining in the central and eastern sections of the site.

It is understood that coal was extracted from the site in a number of phases;

- 1911; the extraction of the Lidgett coal seam via underground methods at depths of 91-94mbgl.
- 1949-1951; extraction of the Unidentified Seam, Dunsil (Harley) Seam, Thin Seam and the Swallow Wood coal seam within the Stead Lane opencast mine, with the maximum recorded depth of excavation being 26.2mbgl.
- 1951; partial extraction of the Swallow Wood coal seam via underground methods at the Skiers Spring and Rockingham Collieries.

Abandonment plans for the opencast workings and selected underground workings have been overlain on the proposed layout, identifying that the base of the opencast within the Swallow Wood seam crosses the south-eastern corner of the proposed building footprint. The base of the opencast in the corner which underlies the proposed building footprint is recorded on the abandonment plan as being 405.37ft (123.4m) which suggests the base of the backfilled opencast should be circa 12m below the current ground level (approx. 135m).

Ground Conditions

Geology

Within the area of the opencast backfill, the following succession was recorded: up to 0.3m of topsoil over variable opencast backfill material comprising clays and sands to 7.1m bgl. Bedrock of siltstone and mudstone underlies the backfill material. Outside the opencast area the ground conditions were recorded to comprise 0.2m of topsoil over granular and cohesive Made Ground to a maximum depth of 2.4m. Bedrock was recorded from 2.4m, with thin coal seams recorded at 5.0m and 5.8m bgl (0.4m and 0.2m respectively) and the Thin Coal seam recorded at 12m bgl (0.55m thickness).

Opencast High Wall Location

Investigation photographs suggests a vertical face to the top of the opencast highwall to the south of the proposed building, which is likely to be the same beneath the proposed building. It is considered that the high wall is likely to be stepped (potentially a couple of steps at this location) or is a vertical face.

It is inferred that the boundary of the opencast pit runs northwest – southeast through the centre of the proposed building, confirming the overlay of the mine abandonment plans for the Stead Lane Colliery.

Environmental Assessment

No elevated concentrations of contaminants have been recorded during previous investigations when screened against the Generic Assessment Criteria for Public Open Space (Park).

A maximum hazardous gas flow rate of 0.3l/hr has been used along with a maximum carbon dioxide reading of 8.5%. No methane or hydrogen sulphide was recorded. MET Engineers calculated that the GSV for carbon dioxide was 0.0255 l/hr. Based on the above information MET have classified the site as Characteristic Situation 2, thus requiring gas protection measures to be implemented into the design.

Geotechnical Assessment

Foundations

Given the variable nature of the Opencast Backfill and the proven presence of the former opencast high wall beneath the proposed building footprint, shallow foundations are not considered to be suitable. Hence, a piled foundation is considered to be the most suitable solution.

Based on the site investigation information available, end bearing piles would socket 1-2m into the predominantly mudstone bedrock at the base of the backfilled former opencast site (anticipated to be approx. 8.10m bgl (176.31mAOD)). As expected from the abandonment plans, three thin shallow coal seams were recorded beneath the proposed building footprint outside the opencast, with the thickest being 0.55m at approx. 12m depth. No evidence of underground workings were noted.

Shrinkability / Volume Change Potential

The cohesive horizons of the Opencast Backfill and the underlying natural mudstone have been shown to have a low volume change potential. Foundations placed on shrinkable soils should be deepened where necessary to accommodate the effects of trees and hedgerows if within influencing distance.

Buried Concrete

Concrete class DS2, AC2.

Pavement Design

In-situ CBR testing suggests that the existing shallow Made Ground materials, which are generally cohesive in nature, exhibit characteristic CBR values in the range of 3-9%; hence it is considered that a design CBR value of 3% should be adopted for the purpose of preliminary pavement design and temporary works design, subject to proof rolling of the formation. The in-situ CBR value must be checked against the Design CBR value to confirm design requirements are being met.

Mining

The site has been subject to coal mining by both opencast and underground methods. Given that the recorded geology identifies in the region of 58m of coal measures strata between the base of the former opencast and the next economically worked coal seam, mineworking treatment is not considered necessary at the site.

The supplementary ground investigation undertaken by MET Engineers has identified the location of the high wall of the former opencast mine, which is inferred to pass below the proposed building footprint along the northwest – southeast axis, as shown in Figure 3 and on the full drawing presented in Appendix A. This confirmed the position shown for the overlay of the mine abandonment plans for the Stead Lane Colliery.

The use of piled foundations will transfer structural loads through the variable opencast backfill material to competent bedrock, and hence will mitigate for the potential for differential settlements across the high wall.

Recommendations

- This report should be submitted to the Coal Authority for their review and approval of the proposed foundation solution.
- Development of a Remediation Strategy to set out the methodology for implementation of remediation options/treatment of unforeseen contamination (including the ground gas protection measures).
- The design installation and verification of the selected gas protection measures should be undertaken in accordance with BS8485:2015 and CIRIA report C735 and an installation and verification report provided..
- The contractor should have robust processes in place to identify any potential asbestos in soils during groundworks, and to investigate and remove suspected asbestos encountered during excavations. This should be in line with the requirements of the Control of Asbestos (CAR) Regulations.

1. Introduction

1.1 Objectives and Brief

Waterman Infrastructure and Environment Limited was instructed by Barnsley MBC (“the client”) to undertake a Interpretative Geotechnical Investigation Report at the site. The main objectives of the report are to:

- Review all available ground investigation information;
- Provide a main investigation as defined by BS10175;
- Derive representative geotechnical parameters in accordance with Eurocode 7 and characterise the ground for the purposes of geotechnical design;
- Provide an assessment of suitable foundation types for the proposed development;
- Further develop the ground model with regards to the coal mining legacy of the site;
- Assess the suitability of materials arising in any earthworks activities for re-use on site or disposal;

1.2 Proposed Development

Current proposals are understood to include the construction of an all-weather sports pitch, archery range, car parking and a pavilion in the western corner of the site. It is understood that the design works are only for the proposed pavilion and car parking area, and not the wider site, as shown on Barnsley MBC Drawing No. 012, presented in Appendix A.

The pavilion building has undergone several design iterations in an attempt to locate the entirety of the build off the footprint of the backfilled opencast mine. A summary of the initial proposals is detailed below and in Figure 1.

The first option looked to position the building to the south towards Sheffield Road; however, this led to the pitch users having to cross the access road and car park in order to reach the pitches. Additionally, there would be loss of views from the activity spaces and no available space for the terrace. The rear elevation of the building would also face the road, with no active frontage.

The second option proposed that the building be orientated along the northern boundary; however, this would not suit the sites’ topography and restrict the access road coming onto the site.

The final option was to relocate the building further north, wholly onto the opencast backfill deposits where the mine workings are known to be at a greater depth. This would also create issues with regard to pitch layout and restrict visibility from the access road.

Figure 1: Initial Design Proposals



1.3 Limitations

The assessment was undertaken in accordance with the scope agreed between Waterman IE and Barnsley MBC, as documented in Waterman IE's fee letter (Ref: WIE20198-100-230912_GEO RevA, dated 12th September 2023), and with Waterman IE's standard Terms of Appointment. The benefit of this report is made to Barnsley MBC.

The information contained in this report is based on the findings of the following reports and investigations:

- Coal Mining Risk Assessment (Report Ref: HOY-AG-VGT-XX-RP-CE-AG3080D-20-AK84) issued by Applied Geology August 2020.
- Ground Investigation Report (Report Ref: HOY-AG-VGT-XX-RP-CE-AG3080D-20-AL24) issued by Applied Geology November 2020.
- Supplementary Site Investigation Report (Report Ref: P22-01115-Met-RP-GE-001) issued by MET Engineers February 2023.
- Coal Mining Risk Assessment (Report Ref: WIE20198-100-R-1.1.3-CMRA) issued by Waterman October 2023.
- Supplementary Site Investigation Report (Report Ref: P22-01115-Met-RP-GE-002) issued by MET Engineers January 2024.

The ground conditions reported relate only to the point of excavation and do not necessarily guarantee a continuation of the ground conditions throughout the non-inspected area of the site. Whilst such exploratory holes would usually provide a reasonable indication as to the general ground conditions, these cannot be determined with complete certainty.

Waterman has endeavoured to assess all information provided to them during this investigation, but makes no guarantees or warranties as to the accuracy or completeness of this information.

The conclusions resulting from this study are not necessarily indicative of future conditions or operating practices at or adjacent to the site.

2. Site Location and Description

2.1 Site Location

The Site is located at National Grid Reference 435907, 399784, north off Sheffield Road, Hoyland, Barnsley.

Figure 2: Site Layout



Source: Google Earth Satellite Imagery. Accessed 09/01/2024.

2.2 Site Description

The site is currently a grassed, vacant plot of land, with a metal palisade fence around the perimeter. The slope generally slopes down from 137mAOD at the western access point off Sheffield Road, down to the southeastern corner at 126mAOD.

It is noted that a turfed pitch has been constructed along the southern boundary, with 2 No. drainage ditches infilled with granular material.

A copy of the topographic Survey drawing of the site is included in Appendix A.

3. Background Information

Below is a summary of the background information contained within the reports detailed in Section 1.3:

3.1 Anticipated Ground Conditions

The anticipated ground conditions are summarised in Table 1 below.

Table 1: Anticipated Ground Conditions

Stratum / Geological Origin	Anticipated Nature	Likely Distribution / Depth	Likely Aquifer Designation / Groundwater Comments
Topsoil	Grass over clay topsoil	Sitewide distribution likely to be confined to shallow depths (<0.2mbgl).	Groundwater unlikely to be encountered within topsoil.
Made Ground	Sandy, gravelly clay with fragments of limestone, chalk brick and wood.	1-1.5m in thickness, likely to be present across the whole site.	Perched groundwater may be present within Made Ground horizons.
Made Ground (Quarry Backfill)	Highly variable. Typically, orange to grey and brown mottled silty sandy clay with boulders.	Present in areas formerly occupied by opencast mine workings. Anticipated to depths of 6-8mbgl.	Perched groundwater may be present within Made Ground horizons.
Pennine Middle Coal Measures Formation	Interbedded mudstone, siltstone and sandstone with coal seams. Weathers to a stiff sandy gravelly clay. Piper Coal seam recorded to be at outcrop (circa 5m depth) in the vicinity of the site, although thought to be only of limited thickness.	Recorded across the whole site. Medium strong locally very weak orange brown and grey siltstone with occasional thin bands of firm clay and cobble-sized ironstone nodules.	Secondary A Aquifer; groundwater may be present.

The Pennine Middle Coal Measures has a regional dip of between 3 and 4 degrees to the north-east in this area. The Dunsil (Harley) Coal seam is shown to outcrop on the site, trending approximately north-west – south-east. The underlying Gawber Coal and Swallow Wood Coal seams are expected to dip below the site.

An old shaft section to the south east of the site recorded the following general succession, which is anticipated to be representative of the strata below the site:

Table 2: Skiers Spring Colliery Section

Stratum	Thickness (m)	Typical Seam Thickness (m)	Alternative Name
Swallow Wood Coal	1.58	0.2 – 3.7	
measures	46.74		
Rock with binds	4.57		Probably represents the Haigh Moor Coal
measures	6.40		

Lidgett Coal	1.07	0.3 – 1.5	
measures	38.91		
Joan Coal	0.51	0 – 1.4	
measures	20.78		
Flockton Thick Coal	3.65	0 – 3.7	
measures	18.06		
Flockton Thin Coal	1.14	0 – 2.2	Top Deep Soft
measures	17.91		
High Fenton Coal	1.45	0 – 4.1	Deep Hard (combined with the Low Fenton)
measures	2.09		
Low Fenton Coal	1.01		
measures	16.74		
Parkgate Coal	2.31	0 – 3.9	Middleton Little
measures	16.97		
Thornccliffe Thin Coal	0.76	0 – 3.1	Middleton Main
measures	70.21		
Silkstone Coal	2.32	0 – 1.6	
measures			

The boundary between the Middle and Lower Coal Measures strata is between the Lidgett and Joan seams.

The bedrock in the general area appears to have been moderately faulted, with two unnamed inferred faults mapped near to, and may encroach onto, the site. These are to the north-west and south-west of the site, with downthrows to the south-east and south-west respectively.

3.2 Potentially Significant Pollution Linkages

Potentially significant linkages between contamination hazard sources and relevant receptors are summarised below:

Table 3: Outline Preliminary Conceptual Site Model

Source	Linkage	Receptor	Risk	Justification / Mitigation
Human Health				
Contamination in site soils and perched/groundwater associated with previous opencast mine workings and surrounding area.	Dermal contact Ingestion Inhalation	Future Site Users	Low	The Site is anticipated to be underlain by a thickness of Made Ground and contamination may be present as a result of the Site's former land use. However, former site investigations have not recorded any contamination and proposed works will require a growing medium for turfed areas which will act as a capping layer.
		Off-site / neighbouring site users	Low	Dusts/ vapours very unlikely to be generated at significant concentrations to migrate off-site and cause harm/nuisance. Risks during the

Source	Linkage	Receptor	Risk	Justification / Mitigation
				construction phase to be managed by use of appropriate working practices.
		Construction workers	Low	Risks to construction workers can be managed through use of appropriate working practices and Personal Protective Equipment. Consideration to be given to the potential presence of hazardous ground gas in excavations.
Ground Gas	Migration and accumulation in confined spaces, followed by asphyxiation/explosion	Future Site Users	Low to Medium	<p>Significant thicknesses of Made Ground may present a potential source of hazardous ground gas.</p> <p>Mine gas may also be present originating from former opencast workings beneath the Site.</p> <p>The risks to future site users to be mitigated by the inclusion of appropriate ground gas mitigation measures, if required, in the proposed buildings.</p>
Property				
Contamination in site soils and perched/groundwater associated with previous site use and surrounding area	Direct Contact	On-site structures and services	Low	Levels of contamination unlikely to be present at concentrations capable of adversely impacting below ground structures and services. Former sulphate testing has confirmed that buried concrete on site should be to DS-1 AC-1s.
Controlled Waters				
Contamination in soil and perched/groundwater associated with opencast / quarry backfill operations.	Leaching Migration Preferential Pathways	Nearby Surface Waters	Low	<p>The Site is assumed to be underlain by a thickness of Made Ground, and former investigation have not recorded any contamination thought to pose a risk to nearby surface waters.</p> <p>Surface water runoff will be managed in hardstanding areas and discharge to on-site drainage.</p> <p>The nearest surface water feature is a stream, 7m to the east of the site boundary.</p>
		Groundwater in Secondary A Aquifers (Bedrock geology)	Negligible	There are no abstractions from the underlying aquifer within 500m of the Site, and the near surface Coal Measures strata are mudstones, hence the risk of contamination to the aquifer is considered to be negligible.

4. Summary of Previous Reports

The following sections are a summary of investigations/reports undertaken at the site and should not be read in isolation. For full details reference should be made to the reports outlined in Section 1.3. Information updated elsewhere in this report is not repeated here.

4.1.1 Applied Geology Desk Study and Phase 1 Coal Mining Risk Assessment

A desk study and coal mining risk assessment was issued by Applied Geology Ltd. in 2020, for the sports field, access road and parking area; no building was proposed at that time. The Coal Mining Risk Assessment has subsequently been superseded by the 2023 Waterman report.

Historical Opencast and Underground Mining

In the southwestern area of the site, where the proposed building is to be located, a section shows topsoil onto a 5.8m thick layer of sandstone, above the Dunsil (Harley) Seam; it is unclear from the mine abandonment plans whether the opencast mine had a near vertical face or was benched. If the latter, it was considered likely that the whole site would be underlain by Made Ground to a significant depth, with the sandstone layer removed.

Based on information from an Abandonment Plan (NE419 (5 Sheets)), included in the appendix of the report, there were 5No. coal seams worked on site, summarised below in Table 4. The depth information included is based upon figures from the abandonment plans, the actual depths of excavation on site may be shallower than presented.

Table 4: Worked Coal Seams from Opencast Abandonment Plan

Geology / Seam Name	Location on Site	Depth to top of seam (mbgl.)	Depth to base of seam (mbgl.)	Seam Thickness (m)
Unidentified Seam (Mined via opencast methods)	Northeastern section of the site.	6.10	6.35	0.25
Dunsil (Harley) Seam (Mined via opencast methods)	Sitewide coverage, excluding long sections along the north and southern boundaries.	6.10	6.86	0.76
Thin Seam (Mined via opencast methods)	Central and southeastern areas of the site.	12.80	13.11	0.31
Swallow Wood Seam (Mined via underground and opencast methods)	Central and southeastern areas of the site.	Maximum extraction depth 26.62		0.99*
Lidgett Seam (Mined via	Central and southeastern areas of	Various between 91.00-94.00		0.3-1.5

Underground the site.
methods)

*It is noted on the 'General Description' that the top 10" (25.4cm) of the Swallow Wood Seam was discarded owing to high ash content.

The abandonment plans detail the greatest depth from which coal was worked via opencast mining was 87.32' (26.62m bgl.) from the Swallow Wood coal seam to the southeast of the site boundary (seams dipping to the northeast). However, from the abandonment plans it is believed that the Swallow Wood seam was first worked by underground methods which plans show extend to the northwest of the site.

Subsequent mine abandonment plans (5843) detail the Lidgett Coal Seam being extracted below the site in the early 19th century, with the Applied Geology Ltd. report suggesting a depth of 91-94mbgl where extracted. This assessment corresponds to the Skiers Spring shaft section which recorded circa 58m of measures between the Swallow Wood and Lidgett Coal seams.

Coal Mining Issues

The report highlights a low risk from recorded underground shallow mine workings, classified as low due to the purported extraction depths of >38mbgl. with any related settlements / movements having ceased. The report does not suggest that the Swallow Wood seam was worked via opencast methods, and instead was mined solely through underground methods; hence AG commented that the 15m of solid stratum between the base of the Thin Seam, and the top of the Swallow Wood seam would provide sufficient capping to support the development.

The report also highlights a low risk on site due to the potential for uncontrolled backfilling of the opencast mining pit.

Recommendations

The report recommended a ground investigation be carried out on site to locate the highwalls associated with the former opencast mine.

4.1.2 AG Ground Investigation Report

Ground Investigation Summary

Applied Geology Ltd. undertook a ground investigation on the subject site during September 2020, including :

- 15 No. machine excavated trial pits;
- 7 No. trenches to investigate the opencast boundary and coal seam outcrops;
- 3 No. soakaway tests in trial pits;
- 14 No. cone penetration tests; and,
- 10 No. driven continuous samples boreholes.

Six monitoring wells were installed during the investigation with five having response zones within the Made Ground – Opencast backfill, and one with a response zone in the Pennine Middle Coal Measures Formation. No groundwater was recorded during the ground investigation or in any of the subsequent monitoring visits.

The report states that the maximum expected depth of the opencast pit was anticipated to be 26mbgl. at the base of the Swallow Wood seam; however, the boreholes carried out reached a maximum of 5.45mbgl. and hence the base of the opencast mine was not proven. The report speculates that the base of the pit was encountered in several locations; however, this may be CPT refusals on boulders / or the testing

locations being towards the outer edge of the opencast pit.

Geological Summary

A layer of topsoil was present on site underlain by Made Ground typically comprising 0.50-0.75m of firm to stiff dark grey and dark brown slightly sandy gravelly to very gravelly clay with rare cobbles of mudstone and siltstone. Underlying the Made Ground was the Opencast Backfill comprised of firm to very stiff friable brown and dark grey slightly gravelly to gravelly clay with occasional to frequent subangular cobbles of mudstone, siltstone and locally ironstone. Gravel was fine to coarse angular to subangular mudstone, siltstone, coal and ironstone.

The trial trenches highlighted that the shallow section of the highwall was a near vertical face, with the exception of the north western corner where the gradient was notably shallow.

The Pennine Middle Coal Measures Formation was recorded around the southern and western perimeter of the site to depths of between 0.9 and 3.0mbgl. The stratum was recorded as firm to stiff becoming very stiff grey and light brown slightly sandy clay with occasional becoming frequent fine to medium gravel lithorelics of mudstone, siltstone and locally clarain and vitrain coal fragments.

A single coal seam was recorded during the ground investigation in the north east of the site, between 2.30 – 2.70mbgl., logged as a black vitrain and clarain coal; interpreted as an Unidentified Seam.

Revised Coal Mining Risk Assessment

AG concluded that they considered there to be a low to negligible risk of coal mining related issues affecting the development. It should be borne in mind that no buildings were proposed at this time. The main highlighted risk was the subsidence hazard from the opencast backfill materials. No recommendations for additional works were given; however a recommendation for a concrete classification of DS-2 AC-2 was deemed appropriate for the site (also suggested that in areas where a pH value of 5.4 is recorded, AC-3z is required).

Geo-environmental Summary

At the time of the report, the proposed site plan detailed football pitches, an archery pitch, temporary car parking and a temporary container pod for changing facilities. Based on the proposals the geo-environmental samples were screened against a generic acceptance criteria (GAC) of Public Open Space (POS Parks) (2.5% SOM). Although a permanent structure in place of the temporary container pod is now proposed the GAC applied is still considered to be appropriate for the development.

Based on the testing completed, no determinants were recorded to exceed the GAC screening values; and hence it was suggested that the risk to human health was negligible, and a recommendation made that no further assessment was required.

Leachate testing carried out as part of the investigation with no samples exceeding the screening values and hence the risk to controlled waters was considered to be negligible.

4.1.3 Met Engineers Supplementary Site Investigation Report

Ground Investigation Summary

Met Engineers Ltd. undertook a ground investigation on the subject site between December 2022 and January 2023; the ground investigation included the following intrusive tests:

- 6 No. machine excavated trial pits;
- 5No. windowless sample boreholes; and,
- 1No. cable percussion borehole.

The purpose of the investigation was to target the area of the proposed building footprint, specifically targeting the overlap with the location of the highwall.

The recorded geology was consistent with that recorded during the Applied Geology ground investigation in 2020; topsoil overlying Made Ground layers comprising soft slightly sandy slightly gravelly clay, onto silty sandy gravelly clay with a moderate cobble/boulder content and anthropogenic materials including plastic, wood, brick, rope and ceramic. Made Ground (Opencast Backfill) material was logged as sand, gravel and clay with grey cobbles and boulders to depths from 0.80 – 8.00mbgl. The cable percussion borehole identified bedrock at a top depth of 8.00mbgl. with the borehole terminating at 8.10m.

It is noted that the trial pitting potentially identified a stepped edge to the highwall within two trial pits at depths of 1.20mbgl and 3.00mbgl.

Proposed Foundation solutions and recommendations

Met Engineers proposed a mixed foundation solution of trench fill on the underlying natural stratum, where the building footprint is situated off the opencast backfill, and a piled solution on the opencast backfill. Furthermore a suspended ground floor was proposed.

Based on the testing results a concrete classification AC-1s was recommended; with allowance to be made for the low to medium volume change potential of the underlying cohesive soils.

4.1.4 Waterman Coal Mining Risk Assessment

Waterman undertook a further Coal Mining Risk Assessment based on the current development in October 2023.

The report concluded that the risk posed by the historical underground and opencast mining is considered to be low to medium, comprising:

- the potential for unrecorded shallow workings to the north of the former opencast site;
- determining an appropriate foundation solution for the building;
- the potential for differential settlement, particularly across the high wall.

The proposed layout has the building straddling the recorded location of the high wall. We would not recommend that approach suggested by MET Engineers (pile the section under the opencast backfill and trench fill the remaining area), but would recommend a piled solution for the full building footprint. This will require the highwall location and profile to be confirmed by further ground investigation. The recorded geology identifies in the region of 58m of measures between the Swallow Wood and Lidgett coal seams, and hence a piled solution founding in the coal measures stratum below the Swallow Coal seam / opencast backfill is considered appropriate.

No mine entries are recorded on the site or within 100m of the site boundary; the risk of an unrecorded mine entry cannot be discounted around the perimeter of the site however is considered unlikely.

The Coal Authority did not report any issues regarding mine gases within 500m of the site boundary, however monitoring of borehole installations has recorded the following maximum concentration of ground gases within the opencast backfill; CH₄ to be <0.1%, CO₂ to be 8.9% and several readings of depleted oxygen with the lowest being 2.6%.

Hence additional ground investigation was recommended on the proposed building footprint to better understand the depth of the backfill, its geotechnical properties and inform on pile design. It was also recommended that additional works are carried out to investigate the nature of the highwall, to ascertain if it is stepped or a near vertical face and confirm the mining situation below the section of the footprint off the former opencast.

5. Recent Ground Investigation

5.1 Design of Investigation

The scope of investigation was determined by Waterman and procured by Barnsley MBC. The exploratory hole locations were selected in order to characterise the ground conditions underlying the proposed community building and parking areas and the nature of the highwall in the north-western corner of the backfilled former opencast pit.

The locations of the investigation holes are presented on the Exploratory Hole Location Plan presented in the factual report and also included in Appendix A.

5.2 Fieldwork

The works were procured to MET Engineers and the fieldwork was carried out over the course of seven days between 14 and 20 December 2023. Table 5 includes a summary of fieldwork activities.

Table 5: Summary of Fieldwork Activities

Phase of Work.	Activity	Contractor	Date	Supervision
Utilities survey and setting out	Scanning for services and setting out exploratory hole locations		14 December 2023	
Ground investigation	Drilling of 4no. rotary openhole boreholes	MET Engineers	14-20 December 2023	-
	Drilling of 1no. rotary cored borehole			
	4no. machine excavated trial pits.			
	3no. in-situ CBR tests			

5.3 Soil Sampling

During drilling and excavation, representative bulk and disturbed samples were recovered for geotechnical testing, in addition to the rock core samples from RC01.

6. Results

Detailed logs of the strata encountered are provided in the exploratory hole logs presented in the Factual Report in Appendix B. A summary of the geological strata and observations made during the fieldwork is presented below.

6.1 Geological Strata

The strata encountered in the investigation were generally consistent with the anticipated geology identified in the previous reports (summarised in Section 3). A summary of the geological strata encountered is shown in Table 6.

Table 6: Geological Strata Encountered

Soil Type	Depths Encountered (mbgl)	Typical Description
Succession on backfilled former opencast mine (RO01, RO02 & RO03)		
MADE GROUND (Grass / Topsoil)	0.00 – 0.30	Grass overlying medium brown partially mottled orange silty slightly gravelly clay with occasional rootlets. Gravel is angular to subangular fine to coarse of siltstone, sandstone, mudstone and occasional limestone/chalk and brick with fragments of wood.
MADE GROUND 2 (Opencast Backfill)*	0.30 – 7.10	Orangish mottled brown silty sandy gravelly clay with a moderate cobble content. Sand is fine, gravel is angular to rounded fine to coarse of mixed lithological including sandstone, siltstone, mudstone, limestone / chalk and coal. Cobbles are angular of siltstone and sandstone up to 90mm across. Relict rootlets noted.
MADE GROUND 3 (Opencast Backfill)*	2.85 – 3.50	Medium brown silty slightly gravelly sand. Sand is fine to coarse. Gravel is angular coarse of siltstone.
Pennine Middle Coal Measures Formation – SILTSTONE (RO01)	2.50 – 6.00	Orangish medium brown and grey thinly bedded highly fractured SILTSTONE / SANDSTONE.
Pennine Middle Coal Measures Formation - MUDSTONE	6.00 – 12.20	Grey thinly bedded highly fractured distinctly weathered MUDSTONE. Recovered as gravels and clayey gravels. Gravel is angular to subangular fine to coarse of mudstone.
Succession off former opencast mine (RC01 & RO04)		
Made Ground (Grass / Topsoil)	0.00 – 0.20	Grass overlying medium brown silty slightly sandy clay with frequent rootlets. Sand is fine.
Made Ground	0.20 – 0.35	Cream sand and gravel. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of chalk and limestone.
Made Ground 2	0.35 – 2.40	Medium brown mottled orange silty sandy gravelly clay with a low cobble content. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of mixed lithologies including siltstone / sandstone, mudstone, coal, chalk / limestone and occasional brick. Cobbles are angular to subangular of mudstone and siltstone up to 70mm across.
Pennine Middle Coal Measures Formation – SILTSTONE	2.40 – 3.90	Orangish medium brown and grey thinly bedded moderately fractured SILTSTONE / SANDSTONE.

Pennine Middle Coal Measures Formation – MUDSTONE	3.90 – 5.00	Grey thinly bedded distinctly weathered clayey MUDSTONE with orange staining noted.
Pennine Middle Coal Measures Formation – COAL (Unidentified Seam)	5.00 – 5.40	Black shiny COAL , partially recovered as gravels.
Pennine Middle Coal Measures Formation – MUDSTONE	5.40 – 5.80	Grey thinly bedded distinctly weathered very clayey MUDSTONE.
Pennine Middle Coal Measures Formation – COAL (Unidentified Seam)	5.80 – 6.00	Black shiny COAL , recovered as gravels. Pyrite mineralisation noted within coal.
Pennine Middle Coal Measures Formation – MUDSTONE	6.00 – 12.00	Grey thinly bedded distinctly weathered very clayey MUDSTONE. Infrequent Bivalve fossils at base.
Pennine Middle Coal Measures Formation – COAL (Thin Seam)	12.00 – 12.55	Black shiny COAL . Pyrite mineralisation noted within coal.
Pennine Middle Coal Measures Formation – MUDSTONE	12.55 – 20.00	Grey thinly bedded distinctly weathered very clayey MUDSTONE.

*Depth to the base of the opencast backfill deepened to south east of the building footprint; depths are summarised below:

RO01: 2.50mbgl. (182.67mAOD)

RO02: 3.90mbgl. (180.86mAOD)

RO03: 7.10mbgl. (177.31mAOD)

The opencast backfill materials was notably absent in RC01 / RO04.

6.2 Location of the Opencast Highwall

Opencast backfill materials were recorded during the ground investigation within boreholes RO-01 / RO-02 / RO-03 / TP-102b / TP-103, typically recorded as: medium grey brown silty sandy gravelly clay with a low to moderate cobble content. Sand is fine. Gravel is angular to subangular fine to coarse of mixed lithologies including siltstone, mudstone and coal. Cobbles are angular to subangular of mudstone and siltstone. Minor organic components were recorded (rootlets / twigs).

The base of the backfilled materials typically deepened towards the southeast of the building footprint; increasing in depth under the proposed building from 2.5mbgl to 4.1mbgl. from RO-01 to RO-03. The base of the opencast backfill was not recorded in TP-102b and TP-103. The depths of backfill are shown on drawing: WIE20198-WIE-ZZ-ZZ-M2-V-005 - PARKSIDE GI OPENCAST LOCATION-A1. An excerpt of this drawing is shown below in Figure 3. The full drawing is presented in Appendix A.

Based on the lack of opencast backfill within RC-01 / RO-04 / TP-102a it is inferred that the boundary of the opencast pit runs northwest – southeast through the centre of the proposed building. This confirms the boundary shown on the overlay of the mine abandonment plans for the Stead Lane Colliery.

Figure 4: Photograph of TP-102b showing a vertical face into the opencast material.



6.3 Underground Structures and Obstructions

No underground structures were encountered during the investigation. Several boulders were recorded during drilling boreholes RO01-RO03 with refusals of UT100 tests on mudstone boulders within the opencast backfill. It is not anticipated that these boulders are likely to cause an issue with any piling operations for the proposed development.

6.4 Geotechnical Laboratory Analysis

The following geotechnical laboratory testing was completed on soil and rock samples recovered from the Site:

- Natural Moisture Content: 4 samples
- Atterberg Limits: 2 sample
- Water Soluble Sulphate: 9 samples
- Total Sulphur: 9 samples
- pH: 9 samples
- UCS: 1 sample
- Point Load (Axial): 6 samples

The results of the laboratory analysis are included in the Factual Report in Appendix B.

6.5 Visual and Olfactory Evidence of Contamination

No visual or olfactory evidence of contamination was recorded during the investigation.

6.6 Groundwater Levels

Groundwater was encountered during the siteworks in two locations, as summarised in Table 7 below.

Table 7: Groundwater Strikes

Location	Groundwater Strike (mbgl)	Comments
RO02	0.40m	Seepage
RO04	0.40m	Seepage

In the previous investigations ground water seepages were recorded within the shallow Made Ground during the investigation works, and within subsequent monitoring visits at depths ranging from 0.2 – 2.87mbgl.

Given the relatively impermeable nature of the Made Ground and opencast backfill it is considered likely that the recorded groundwater levels represent perched groundwater.

6.7 Ground Gas

As part of the previous investigation, 6no. rounds of ground gas monitoring were undertaken. No methane was recorded but a maximum carbon dioxide reading of 8.5% was recorded, although the majority of readings were below 5%. A maximum flow of 0.3l/h was recorded.

Atmospheric pressures at the time of monitoring varied between 970mb and 1013mb.

The Site is not in an area of high radon levels and hence no radon protection measures are considered necessary in the proposed building.

7. Geotechnical Testing

7.1 In-Situ Testing

7.1.1 Standard Penetration Testing

Standard Penetration Tests (SPT's) were undertaken within the boreholes to provide 'N' values for empirical assessment of strength and density parameters. In line with BS5930:2015+A1:2020, all SPT-N values shown on the exploratory hole logs are uncorrected. As described in BS EN ISO 22476:2005 and also by different authors, drill hammer, used equipment and other factors might have a considerable impact on the obtained SPT-N values and thus on the comparability of the results.

Therefore, corrected N-values are used for further consideration and interpretation in this report. The energy ratio for the specific equipment on site was 71% and has been used to calculate standardised N_{60} values summarised in Table 8.

Table 8: Standard Penetration Test Results

Stratum / Geological Origin	Range of SPT- N_{60} Values	Number of Tests	Comments	Derived Values Range of ϕ'/cu
Made Ground (Opencast Backfill)	11.5 – 16 One test at 5.10m refused ($N > 50$)	4	Highly variable soft to very stiff.	45 - 70kPa
Pennine Middle Coal Measures Formation – SILTSTONE	36 – 44	3	Extremely Weak/weathered siltstone	42°
Pennine Middle Coal Measures Formation – MUDSTONE	>50	6	Weak	>250 kPa

7.1.2 In-Situ CBR Testing

In-situ plate load tests were undertaken at four locations within the area of the proposed car park for the purpose of pavement design. Tests were undertaken from 0.5mbgl, on the Made Ground. The results are summarised in the table below.

Table 9: Plate Load Test Results

Exploratory Location	Anticipated Ground Conditions	CBR Value (%)	Characteristic CBR Value (%)
CBR-01	Made Ground	94	Result considered unrepresentative of ground conditions.
CBR-02	Made Ground	8	8%
CBR-03	Made Ground	9.8	9%
CBR-04	Made Ground	3.4	3%

Based on the results above, a characteristic CBR value for the site of 3% should be adopted for the purposes of initial design works. It is recommended that once the grass / topsoil layer is stripped and the formation level is proof rolled that additional CBR testing is carried out to confirm construction CBR values.

It is noted that due to the highly variable nature of the opencast backfill soft spots are likely to be present across the site, and hence these should be removed and backfilled and compacted with clean crushed stone (6F2 or similar).

7.2 Laboratory Testing

7.2.1 Natural Moisture Content and Plasticity Index

2no. samples were scheduled for moisture content and Atterberg limits, one of the opencast backfill material (RO-03 at 5.80mbgl) and one of the mudstone (RC-01 at 3.90mbgl).

Table 10: Volume Change Potential

Stratum / Geological Origin	Range of Plasticity Indices % (Modified)	Volume Change Potential
Made Ground (Opencast Backfill)	7	Low
Pennine Middle Coal Measures	9.1	Low

7.2.2 pH Value and Water Soluble Sulphate (SD1 Suite)

The Aggressive Chemical Environment for Concrete classifications for the material types identified at the site have been determined in accordance with BRE Special Digest 1:2005 (SD1). SD1 requires that sites are first identified as being in one of four categories based on natural ground / 'Brownfield' conditions and pyrite content. The site has been categorised as: brownfield - pyritic.

The results of laboratory testing are included in the factual report presented in Appendix B and summarised in Table 11 below.

Table 11: pH and Sulphate

Stratum / Geological Origin	No. of results	Range of Results and Characteristic Water Soluble Sulphate Value (mg/l SO ₄)	Range of Results and Characteristic pH Value
Made Ground (Opencast Backfill)	4	20 – 70 (70 mg/l)	8.17 – 8.48 (8.17)
Made Ground	2	50 – 70 (70 mg/l)	5.06 – 6.74 (5.06)
Pennine Middle Coal Measures	3	10 – 30 (30 mg/l)	8.08 – 8.58 (8.08)

As the characteristic value of sulphate is less than 3000mg/l and the characteristic pH is greater than 5.5, the concentrations of magnesium, nitrate and chloride are not considered significant in determining the design sulphate class.

7.2.3 Unconfined Compressive Strength (Rock)

It is noted that MET Engineers report states that the sample scheduled for uniaxial compressive strength testing (RC-01 at 13.80m – 14.20m bgl) was deemed unsuitable for testing. The sample was instead submitted for point load testing.

7.2.4 Point Load Testing (Rock)

Point load strength tests were undertaken on samples of the underlying bedrock. The results of the tests

are presented within Appendix B and summarised within Table 12 below.

Table 12: Summary of Point Load Testing

Stratum / Geological Origin	Exploratory Hole Reference and Depth	Orientation	Corrected Strength (I_{s50} , MPa)
Pennine Middle Coal Measures	RC-01 at 6.45m	Axial and Perpendicular to planes of weakness	0.01
			0.02
	RC-01 at 7.35m	Axial and Perpendicular to planes of weakness	0.90
			1.04
	RC-01 at 8.70m	Axial and Perpendicular to planes of weakness	0.43
			0.89
	RC-01 at 10.30m	Axial and Perpendicular to planes of weakness	0.91
			1.01
	RC-01 at 12.60m	Axial and Perpendicular to planes of weakness	0.16
			0.08
RC-01 at 14.80m	Axial and Perpendicular to planes of weakness	0.35	
		1.09	
		1.53	
			1.12

Whilst there appear to be a weaker surface layer, the mudstones show a relatively consistent strength with I_{s50} values of between 0.08MPa and 1.53MPa and an average value of 0.79MPa. These correlate to a weak surface layer with an unconfined compressive strength of 0.2MPa grading into more competent mudstone with a compressive strength of 1.7 – 20MPa. The start at the base of the backfilled opencast would be expected to have a compressive strength of at least 1.7MPa.

7.3 Excavations, Trench Shoring & Dewatering

All trenches should be excavated in accordance with CIRIA Report 97 ‘Trenching Practice’. Comments relating to groundwater ingress are included in the logs within the Factual Report, but observations typically noted water seepages at 0.40m depth. Subsequent monitoring visits recorded standing water at depths ranging from 0.20 – 2.87mbgl.

Given the relatively impermeable nature of the Made Ground and opencast backfill, it is considered likely that the recorded groundwater levels represent perched groundwater. Hence, localised dewatering is likely to be required although it is anticipated that the amount of water will be limited and should be adequately dealt with by sump pumping techniques.

On the basis of information currently available, shallow excavations (<1.2m) should remain stable in the short term. Shoring may be required within the Made Ground, given its highly variable nature and also in any excavations required to remain open for the medium to long term. Shoring must be used for any excavation requiring man entry.

8. Ground Gas

8.1 Ground Gas Assessment

The following ground gas assessment is based upon 6no. rounds of ground gas monitoring completed by MET Engineers from February – April 2023.

A maximum hazardous gas flow rate of 0.3l/hr was used along with a maximum carbon dioxide reading of 8.5%. No methane or hydrogen sulphide was recorded. MET Engineers calculated that the GSV for carbon dioxide was **0.0255 l/hr**.

Based on the above information, MET classified the site as Characteristic Situation 2, thus requiring gas protection measures to be implemented into the design.

8.2 Selection of Appropriate Protective Measures

With reference to Table 4 of BS8485, a site falling into CS 2 with proposed Type B buildings requires a gas protection score of 3.5 points. Based on the proposals it is recommended that this be achieved by implementing a reinforced suspended floor slab (1.5 points) and a gas resistant membrane (2 points). The detailed design of protection measures, and subsequent installation/inspection, should be undertaken by an appropriately qualified, competent person.

The overall level of risk associated with hazardous gas at the Site should be kept under review through the design process, particularly in the event that the end use of the site is changed.

8.3 Radon Gas

In addition to the above, with regard to naturally occurring radon, the Site is located in an area with a maximum potential of 1-3%; as such it is anticipated that no protection measures are required with respect to radon gas. However this approach should be confirmed with building control.

9. Geotechnical Assessment

9.1 Proposed Development

Current proposals are understood to include the construction of an all-weather sports pitch, archery range, car parking and a pavilion in the western corner of the site. If development proposals change, it may be necessary to revise the conclusions and recommendations made in this report and Waterman IE should be contacted to provide further advice.

9.2 Characteristic Values and Design Bearing Resistance

Based upon the site investigation data and a review of the derived values summarised in Section 8, characteristic values can be assigned to each strata. EC7 defines the characteristic value of a soil or rock as a cautious estimate of the value affecting the occurrence of the limit state. The characteristic values to be used in design are highlighted in Table 13 and considered to be:

Table 13: Characteristic Values for Geotechnical Design

Stratum / Geological Origin	Strength / Density Description	Undrained Strength (cu - kPa)	Angle of Shearing Resistance (ϕ' - deg)
Made Ground – Opencast Backfill	Soft to Very Stiff – highly variable. Low to High Strength.	45 kPa	-
Pennine Middle Coal Measures - Siltstone	Extremely Weak	-	42°
Pennine Middle Coal Measures – weathered Mudstone	Very Weak	0.2MPa	-
Pennine Middle Coal Measures – Mudstone	Very Weak to Weak becoming stronger with depth	1.7Pa 10MPa	-

9.3 Foundations

Given the variable nature of the Opencast Backfill and the proven presence of the former opencast high wall beneath the proposed building footprint, shallow foundations are not considered to be suitable. Furthermore, whilst it is anticipated to be a lightly loaded structure, MET Engineers' recommendation of a hybrid foundation solution comprising piled foundations within the Opencast Backfill and shallow strip foundations within the natural superficial soils is not considered appropriate due to the potential risk of differential settlement. Hence, a piled foundation is considered to be the most suitable solution.

9.3.1 Piled Foundations

Based on the site investigation information available, end bearing piles would socket 1-2m into the predominantly mudstone bedrock at the base of the backfilled former opencast site (anticipated to be approx. 8.10m bgl (176.31mAOD). As expected from the abandonment plans, three thin shallow coal seams were recorded beneath the proposed building footprint outside the opencast, with the thickest being 0.55m at approx. 12m depth. No evidence of underground workings were noted.

The final design of the piles will be the responsibility of the piling contractor. While a number of boulders were identified during drilling in the opencast backfill, these are not expected to have a significant impact on piling works. Notwithstanding, an allowance for probing of pile positions and/or drilling of obstructions may be required.

The influence of the overlying Made Ground should be ignored in the pile capacity calculations. During detailed pile design the choice of factors of safety should ensure that appropriate safe working loads and settlement tolerances are met.

Preliminary pile resistance calculations have been undertaken to provide estimations as to the capacities achievable in a variety of pile constructions and assuming a relatively small pile diameter (300mm) given the anticipated light loadings of the proposed structure. The skin friction of any overlying Made Ground has been ignored. These calculations were undertaken based on the findings of the intrusive investigation and laboratory testing undertaken across the site. The following assumptions have been made:

- Piles types have been assumed to be continuous flight auger (CFA) or bored piles;
- Both low and high displacement driven CFA piles have been considered;
- Piles are to be socketed a minimum of 1m into competent mudstone or siltstone bedrock;
- Groundwater has been assumed to be 0.40m bgl;
- Piles are constructed of concrete with a compressive strength of 40 MPa;
- 10mm wall thickness and open base for low displacement driven piles;
- Bentonite is not used in the construction of bored piles.

The following shall be used only as guidance and shall not be used as an indicator of the final capacity of design parameters of piled solutions at the site.

Table 14: Conservative Estimated Pile Capacities

Pile Diameter	Estimated Pile Load by Diameter (kN)
	d = 300mm
High Displacement Driven Piles	1199
Low Displacement Driven Piles	863
Bored Piles	1354

An acceptable percentage of piles should be load tested to at least twice working load. All piles should be integrity tested.

A number of boulders were noted during the investigation; these could impact the penetration of the piles and hence may need to be removed.

Although unlikely on this site, on significantly contaminated sites, the Environment Agency may object to the use of piles on the basis that they can introduce pathways for contaminant migration. Such objections can usually be overcome if piles are designed in accordance with the EA's advice "Piling and Penetrative Ground Improvement Methods on Land Affected by contamination: Guidance on Pollution Prevention. NC/99/73.

Consideration should be given to the re-use of pile arisings; it may be possible to re-use pile arisings subject to risk assessment; however, certainty of use and volume should be confirmed in accordance with the requirements of CL:AIRE guidance.

The effects of noise and vibration (e.g. from piling plant) on neighbouring structures / properties should be addressed as part of the contractors method statement.

9.4 Shrinkability / Volume Change Potential

The cohesive horizons of the Opencast Backfill and the underlying natural mudstone have been shown to

have a low volume change potential. Foundations placed on shrinkable soils should be deepened where necessary to accommodate the effects of trees and hedgerows if within influencing distance.

Foundations within the zone of influence of existing or proposed trees should be deepened as necessary in accordance with recommendations provided in NHBC Chapter 4 – Building Near Trees. If trees are present within influencing distance of proposed foundations, a tree survey should be undertaken to identify appropriate founding depths.

9.5 Floor Slabs

The floor slab design should take account of the ground gas classification of CS2 (subject to Regulator approval), and appropriate protection measures incorporated. It is envisaged that a reinforced suspended floor slab with ground gas protective measures will be utilised.

9.6 Design Class for Concrete

Based on testing undertaken by Applied Geology and MET Engineers, a Design Sulphate (DS) and Aggressive Chemical Environment of Concrete (ACEC) classification of DS2 AC2 are deemed appropriate.

Groundwater conditions at the site are considered to be static.

9.7 Earthworks / Pavement Design

No specific earthworks testing was undertaken as it is envisaged that there will be no significant areas of cut within the development and that any required raising of levels to level the area of the proposed building will be undertaken using imported aggregates.

Construction plant should be provided with an adequate working platform in line with the requirements of BRE report, “BR 470: Working Platforms for Tracked Plant”. Again, further advice should be sought from the temporary works designer.

In-situ CBR testing suggests that the existing shallow Made Ground materials, which are generally cohesive in nature, exhibit characteristic CBR values in the range of 3-9%; hence it is considered that a design CBR value of 3% should be adopted for the purpose of preliminary pavement design and temporary works design, subject to proof rolling of the formation. The in-situ CBR value must be checked against the Design CBR value to confirm design requirements are being met.

9.8 Groundwater / Stability of Excavations

Comments relating to groundwater seepages are included in the logs in Appendix B. Perched groundwater has been recorded at 0.4m bgl, however subsequent monitoring recorded standing water at depths ranging from 0.20 – 2.87mbgl.

Given the relatively impermeable nature of the Made Ground and opencast backfill, it is considered likely that the recorded groundwater levels represent perched groundwater. Hence, localised dewatering is likely to be required although it is anticipated that the amount of water will be limited and should be adequately dealt with by sump pumping techniques.

On the basis of information currently available, shallow excavations (<1.2m) should remain stable in the short term. Shoring may be required within the Made Ground, given its highly variable nature and also in any excavations required to remain open for the medium to long term. Shoring must be used for any excavation requiring man entry.

With regard to shoring and de-watering measures, further advice should be sought from the temporary works designer, however, the following factors should be considered:

- All trenches should be excavated in accordance with CIRIA Report 97 'Trenching Practice';
- Trench shoring should be keyed into basal materials beneath the base of the trench. The embedment depth may be significantly deeper than the depth of the excavation being supported; and
- Simple sump pumping may be required to control any groundwater ingress into excavations.

Consideration should be given to the re-use of arisings from foundation excavations / drainage runs, etc if possible

In line with BS6031, all excavations should be examined daily by a competent person to ensure that they remain safe. Where the sides cannot be sloped back to a safe angle, as approved by a competent and experienced person, their continued stability should not be taken for granted. Vertical or steep faces should be provided with support unless instructed otherwise by a competent person.

9.9 Mining

The site has been subject to coal mining by both opencast and underground methods. Given that the recorded geology identifies in the region of 58m of coal measures strata between the base of the former opencast and the next economically worked coal seam, mineworking treatment is not considered necessary at the site.

The supplementary ground investigation undertaken by MET Engineers has identified the location of the high wall of the former opencast mine, which is inferred to pass below the proposed building footprint along the northwest – southeast axis, as shown in Figure 3 and on the full drawing presented in Appendix A. This confirmed the position shown for the overlay of the mine abandonment plans for the Stead Lane Colliery.

The use of piled foundations will transfer structural loads through the variable opencast backfill material to competent bedrock, and hence will mitigate for the potential for differential settlements across the high wall.

9.10 Soakaway Drainage

Given the widespread deep Made Ground recorded across the site, soakaway drainage is not considered suitable for use at the site.

10. Conclusions and Risk Evaluation

10.1 Environmental Assessment

Following the implementation of the ground investigation, the contaminant linkages identified in Section 3.2 have been re-evaluated and reclassified in relation to the additional information obtained. The results of the reassessment are summarised in the revised conceptual site model below:

Table 15: Revised Conceptual Site Model

Source	Pathway	Receptor	Active Pathway?
Contamination within Made Ground	Direct dermal contact or ingestion of soils, or inhalation of fibres, dust and/or vapours (i.e. human interaction with surface and sub-surface materials).	Future site users	No – previous site investigations have not recorded any contamination exceeding the adopted screening criteria for POS – Public. Furthermore, the proposed works will require a growing medium for turfed areas which will act as a capping layer.
		Construction and maintenance workers	No – can be managed by appropriate risk assessments and method statements
	Airborne transport of dusts, lateral migration and inhalation of gases and vapours. Lateral and vertical migration of dissolved and free phase contamination in groundwater.	Adjacent site users	Yes, but during construction only and can be managed on site
		Secondary A Aquifers	No – proposed buildings and hardstandings will minimise infiltration
	Leaching and horizontal or vertical migration through the unsaturated ground, either through permeable sub-surface materials and/or preferential pathways; Leaching to surface water run-off/drainage. Lateral and vertical migration of dissolved and free phase contamination in groundwater.	Nearby Surface Waters	No – surface run-off will be controlled by site drainage.
		Construction and maintenance workers	Yes – can be managed by appropriate risk assessments and method statements
	Indoor and outdoor inhalation of fibres, ingestion of contaminated soil and soil dust and direct contact with contaminated soil and soil dust.	Construction and maintenance workers	Yes – can be managed by appropriate risk assessments and method statements
Direct contact between potable water supply pipes.	Future site users	Yes – barrier pipes to be used	
Direct contact between buried concrete or floor slabs and ground or groundwater with a high sulphate content.	Building infrastructure: buried concrete	Yes – appropriate design of buried concrete for level of sulphate recorded	
Ground gas: elevated carbon dioxide but limited flow	Accumulation of ground gas followed by inhalation / asphyxiation and explosive risks.	Future site users	Yes - appropriate design of building

The potential contaminant linkages described above can be managed by appropriate design of the development and mitigation measures/contractor working methods during the redevelopment of the site.

11. Recommendations

The following actions are recommended to address the potentially unacceptable risks that remain:

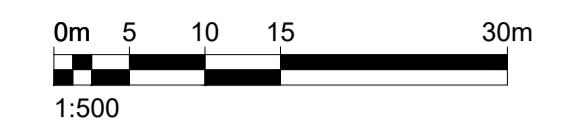
- This report should be submitted to the Coal Authority for their review and approval of the proposed foundation solution.
- Development of a Remediation Strategy to set out the methodology for implementation of remediation options/treatment of unforeseen contamination (including the ground gas protection measures).
- The design installation and verification of the selected gas protection measures should be undertaken in accordance with BS8485:2015 and CIRIA report C735. An installation and verification report should be provided which as a minimum should include an accurate description of the measures actually installed and present the evidence gathered to confirm that installed measures are suitable for purpose.
- The contractor should have robust processes in place to identify any potential asbestos in soils during groundworks, and to investigate and remove suspected asbestos encountered during excavations. This should be in line with the requirements of the Control of Asbestos (CAR) Regulations.

APPENDICES

A. Site Plans

DO NOT SCALE FROM THIS DRAWING. ALL DIMENSIONS TO BE CHECKED ON SITE BY CONTRACTOR. REPORT ANY DISCREPANCIES TO DRAWING AUTHOR AND PROPERTY SERVICES TEAM. DRAWING OR CONTENTS SHOULD NOT BE DUPLICATED WITHOUT PRIOR CONSENT.

DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER PROJECT DOCUMENTS INCLUDING BUT NOT LIMITED TO DRAWINGS, SPECIFICATIONS, SCHEDULES



NOTES

Rev	Notes	Date	Issued By
P8	Overspill layout reconfigured.	09/02/23	BST
P7	Layout updated in line with topo survey information. Pitch layout added from Football Foundation. Overspill car parking added.	16/01/23	BST
P6	Building footprint amended to 730m2.	29/06/22	BST
P5	Building footprint amended to 700m2. Parking increased to 68 spaces. Terrace added. Mover storage added. Steps/ramp removed.	14/04/22	BST
P4	Building arrangement amended to suit single storey first phase build working with slope of site.	21/01/22	BST
P3	Tiered seating omitted. Steps and ramped access introduced down to pitch level. Building name amended.	20/01/22	BST
P2	Building footprint reduced to suit existing provision. Future phase extensions indicated. Disabled parking spaces relocated and no. additional standard spaces added. Car park notes updated.	18/01/22	BST
P1	First Issue	06/12/21	BST



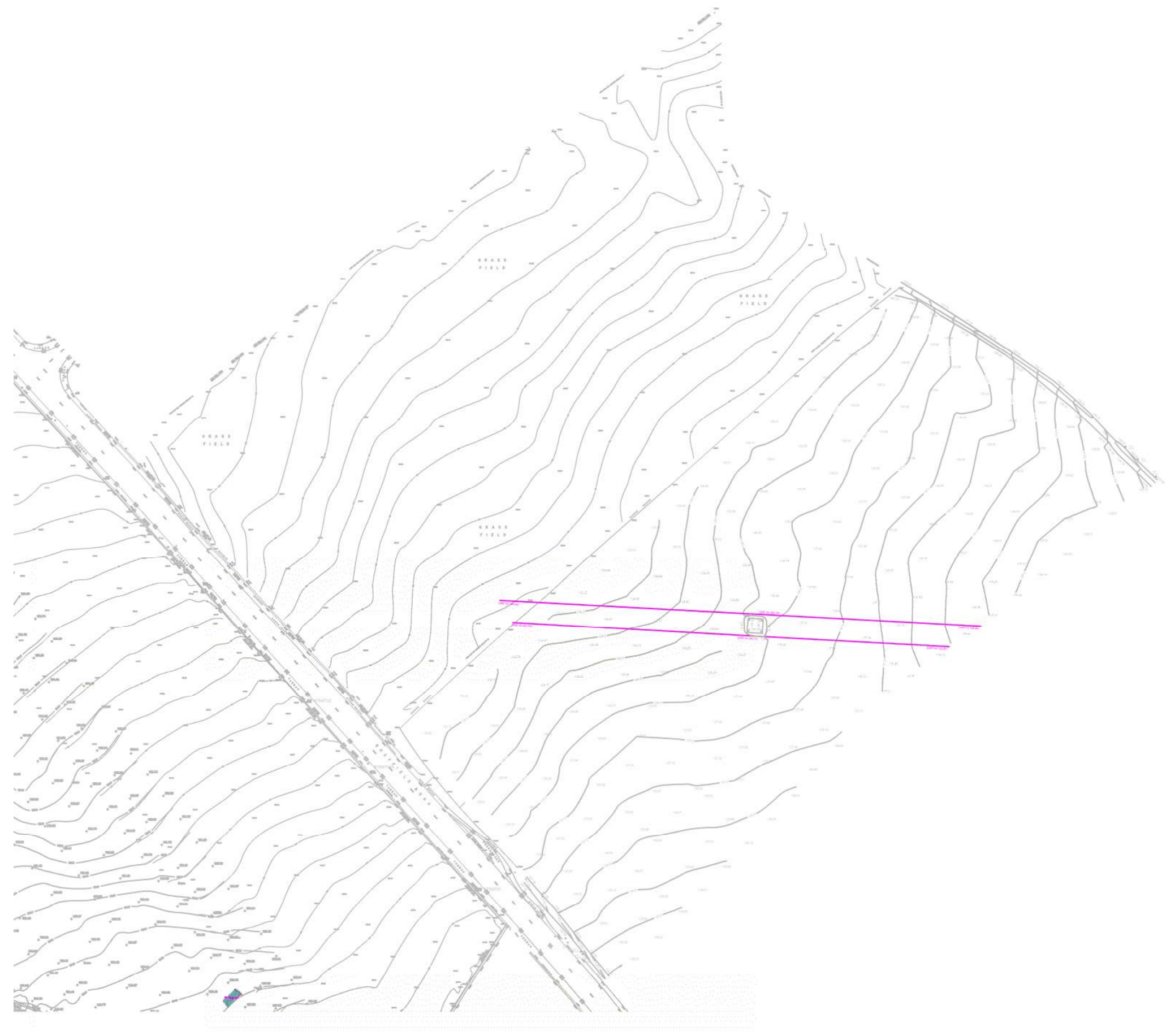
SERVICE
B.E.S.T

PROJECT
Parkside Sports & Community Centre

TITLE
Proposed Site Layout

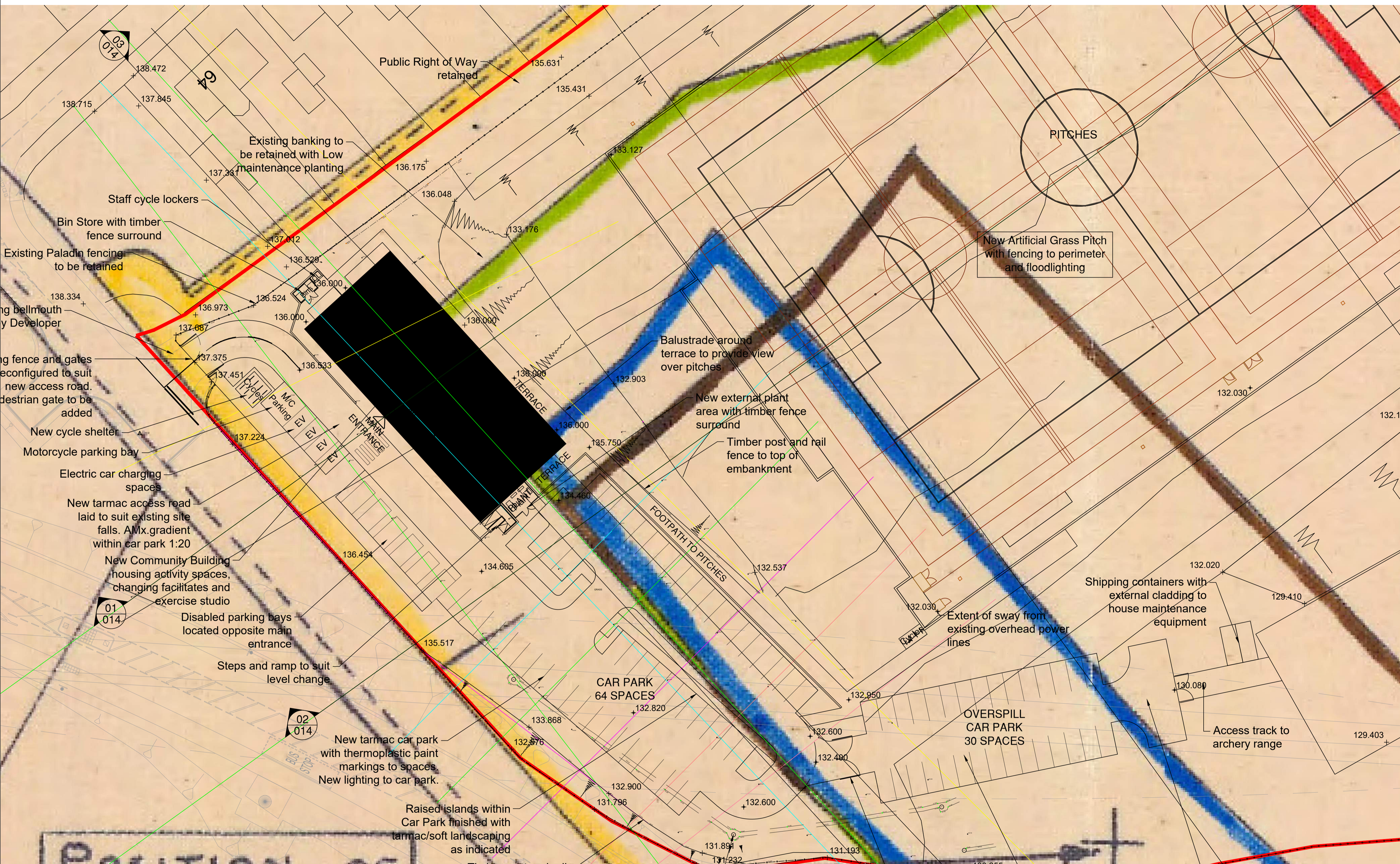
PROJECT REF	DRAWING REFERENCE	REV
1:500	012	P8
SCALE	DISCIPLINE	SHEET SIZE
1:500	ARCHITECTURE	A1
PURPOSE OF ISSUE	Drawn	Checked
INFORMATION	BST	





STEAD LANE OPENCAST MINING PLAN - OE/COMP/03/160 - COAL AUTHORITY Cat. No. NE419

This drawing should not be scaled. Dimensions to be verified on site. Any discrepancies should be referred to the Engineer prior to work being put in hand.
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GENERAL NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL ENGINEER'S, ARCHITECT'S OR OTHER RELEVANT DRAWINGS AND SPECIFICATIONS.
2. ALL DIMENSIONS AND LEVELS ARE TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO PREPARING ANY WORKING DRAWINGS OR COMMENCING ON SITE.
3. THE CONTRACTOR MUST ENSURE AND WILL BE HELD RESPONSIBLE FOR THE OVERALL STABILITY OF THE BUILDING/STRUCTURE/EXCAVATION AT ALL STAGES OF THE WORK.
4. ALL WORK BY THE CONTRACTOR MUST BE CARRIED OUT IN SUCH A WAY THAT ALL REQUIREMENTS UNDER THE HEALTH AND SAFETY AT WORK ACT ARE SATISFIED.
5. ALL WORK IS TO BE CARRIED OUT IN COMPLIANCE WITH THE REQUIREMENTS OF THE RELEVANT STATUTORY AUTHORITIES AND REGULATIONS.

Rev	Date	Description	By	CHK
A01	16.10.23	FOR INFORMATION	RP	PE

Amendments

Project: **PARKSIDE, HOYLAND COMMON**

Title: **STEAD LANE OPENCAST MINE OVERLAY**

Client: **BARNSELY MBC**



5th Floor, 1 Cornwall Street, Birmingham, B3 2DX
 +44 121 212 7700
 mail@watermangroup.com www.watermangroup.com

Work Stage: **STAGE 0** RIBA Strategic definition

Subsidiary: **INFORMATION** S2

Designed By: **RP** Director **PE** Waterman Ref: **onsultin**

Drawn By: **RP** Date: **OCTOBER 2023** Scales @ A1: **NTS**

Project: **WIE20198-WIE-ZZ-M2-V-001** A01

QUANTITIES WORKED

TOTAL AREA REQUISITIONED	78.811	ACRES, SHEWN
TOTAL AREA WORKED EXCLUDING BATTERS	46.21	ACRES
TOTAL COAL RECOVERED FROM ABOVE	168,769	TONS

NAMES OF SEAMS WORKED FOR ABOVE TONNAGE (SEAMS NAMED FROM LEFT TO RIGHT IN GEOLOGICAL DESCENDING ORDER)	UNIDENTIFIED	HARLEY	TRIN	SUNFLOW WOOD
AREA OF COAL SEAM WORKED COLOUR EDGED (SEAMS COLOURED FROM LEFT TO RIGHT IN GEOLOGICAL DESCENDING ORDER)	[Red Box]	[Green Box]	[Blue Box]	[Yellow Box]
TOTAL OLD WORKING VOIDS IN COAL SEAM IN CUBIC YDS.				
AREA OF SEAM WHERE OLD WORKING VOIDS WERE LOCATED				
DIP AND DIRECTION OF EACH SEAM SHEWN				
REDUCED LEVELS TO ORDNANCE DATUM SHEWN (RELATIVE TO NEWLYN)	GL 445.0	GL 447.1	GL 442.0	GL 444.0
FAULTS SHEWN WITH THROW IN FEET ON DOWNTHROW SIDE	BC 472.0	BC 422.0	BC 400.1	BC 367.0
DEEP MINE PROTECTION DRAIN SHEWN THUS				

File Path: \\waterman-consulting.com\projects\WIE\WIE20198 - Hoyland Common, Barnsley\1007_CAD\06_Cmbk

B. Factual Ground Investigation Report

Appendices

Interpretative Geotechnical Investigation Report
Document Reference:

29 January 2024

Our Reference: **P22-01115-Met-RP-GE-002**

Mr Ben Taylor
Barnsley Metropolitan Borough Council
Place Directorate
Gateway
Barnsley MBC
South Yorkshire
S70 9GG

Re: The site at Parkside Sports and Community Centre, Hoyland, Barnsley, S74 0AH – Results of Supplementary Intrusive Investigation

Dear Ben,

Met Engineers attended the above site between 15th to 20th December 2023, and undertook a supplementary intrusive investigation in order to further assess ground conditions to aid in the design of the proposed development. The supplementary works were specified by the client's structural engineer, and involved:

- 4No plate load CBR tests in the location of the proposed access road and car parking areas.
- 5No boreholes, which utilized a combined dynamic sampling, open holing and coring drilling technique, which targeted the footprint of the proposed community building.
- 3No trial pits in the location of the proposed access road and car parking areas.
- Associated geotechnical laboratory testing.

The locations of the intrusive positions can be found on the plan provided in appendix I.

Boreholes

5No boreholes were drilled to depths ranging between 7.95mbgl (RO-04) to 20.00mbgl (RC-01). RO-01, RO-02 and RO-03 were evenly spaced along the north eastern side of the proposed community building, RO-04 was located within the southern corner, and RC-01 was located in the north western corner.

Made ground was identified in all boreholes to depths of between 0.60mbgl (RO-01 to RO-03) and 0.90mbgl (RC-01), and generally comprised silty sandy gravelly clay with anthropogenic materials including brick, ceramic, and wood fragments. Sand and gravel fill was recorded in RC-01 between 0.20-0.35mbgl, and in the RO-04 and RC-01 locations reworked ground was recorded at depths of 0.65-1.85mbgl and 0.90-2.40mbgl respectively. Quarry backfill was recorded in boreholes RO-01 to RO-03, to bottom depths of between 2.50mbgl (RO-01) and 7.10mbgl (RO-03), and comprised silt, clay, sand and gravel with a high cobble and boulder content. Bedrock was found in all locations at top depths of between 1.85mbgl (RO-04) and 7.10mbgl, and generally comprised interbedded siltstone, sandstone and mudstone. Intact coal seams were recorded within 3No intrusive locations (RO-01, RO-04 and RC01), and no evidence of voids or worked coal seams was noted.

A summary of the strata encountered is presented in the below table, and the full borehole logs can be found in appendix II.

Strata	Location Ref. and Depths Encountered (mbgl)				
	RO-01	RO-02	RO-03	RO-04	RC-01
Made Ground	0.00-0.60	0.00-0.60	0.00-0.60	0.00-0.65	0.00-0.20 0.35-0.90
Fill	-	-	-	-	0.20-0.25
Reworked	-	-	-	0.65-1.85	0.90-2.40
Quarry Backfill	0.60-2.50	0.60-3.90	0.60-7.10	-	-
Bedrock	2.50-8.08	3.90-9.19	7.10-12.20	1.85-7.60	2.40-20.00
Coal Seams (intact)	7.20-7.80	-	-	5.30-6.00 6.02-6.20	5.00-5.40 5.80-6.00 12.00-12.40 12.50-12.55

Trial Pits

4No trial pits were excavated to depths ranging between 1.75mbgl (TP102A) and 4.60mbgl (TP102B). The trial pits identified topsoil in all locations to depths of between 0.30mbgl in TP103, and 0.40mbgl in the remaining locations. The topsoil was classified as made ground in the TP101 and TP103 locations due to the presence of anthropogenic materials. In TP101, gravel fill was recorded at 0.40-0.50mbgl, and potential relict topsoil at 0.50-0.70mbgl. Reworked ground was identified in TP101 and TP102A at depths of between 0.70-1.10mbgl and 0.40-1.10mbgl respectively, and natural deposits comprising silty sandy slightly gravelly clay were identified in TP101 at depths of 1.10-2.00mbgl. Quarry backfill was recorded in TP102B and TP103 at depths of 0.40-4.60mbgl and 0.30-4.10mbgl respectively, which generally comprised sand, gravel and clay with a high cobble and boulder content.

Trial pit TP102B was undertaken as an extension to TP102A in a north easterly direction, with the aim of identifying the high wall of the opencast coal mine. The approximate location of the high wall was recorded using a GPS, and is denoted by a red line on the plan provided in appendix I. In addition, photographs of the high wall are presented within the full trial pit logs included within appendix IV.

Plate Load CBR Testing

4No plate load CBR tests were carried out across the site at depths of between 0.40mbgl (CBR04) and 0.50mbgl (CBR01-CBR03), using a 13-tonne excavator as kentledge. The tests were undertaken within the silty slightly sandy gravelly clay recorded to underlie the made ground topsoil material. The approximate equivalent CBR values ranged between 3.4% (CBR04) to 94% (CBR01). The locations of the plate load CBR tests can be found within appendix I, a summary of the ground conditions identified at the testing locations can be found in appendix V, and the full testing results are included within appendix VI.

Geotechnical Testing Results

The client requested the following geotechnical laboratory testing on soil samples extracted from the intrusive borehole locations, alongside in-situ SPT strength testing undertaken throughout the progression of the boreholes:

- 4No moisture content of soil
- 2No Atterberg limits
- 6No point load (axial) tests
- 9No pH

- 9N_e water soluble sulphates (2:1 extraction)
- 1N_e uniaxial compressive strength

It should be noted that the sample scheduled for the uniaxial compressive strength testing (RC-01 at 13.80mbgl-14.20mbgl), was deemed unsuitable for the testing as the sample broke during preparation works at the laboratory. At the instruction of the client, the sample was instead submitted to point load testing.

It was also initially proposed to undertake UT100 sampling during the borehole works, however due to the high cobble and boulder content of the quarry backfill material underlying the site, the ground conditions were not amenable to the sampling. UT100's were attempted, however recovery of material was not possible. The depths at which the UT100 sampling was attempted are recorded within the borehole logs provided in appendix III.

The full laboratory testing results and certificates are provided in appendix VII.

If you have any queries with regards to the above, please do not hesitate to get in touch.

Yours sincerely,



Olivia Francis

Assistant Geo-Environmental Engineer

For and on behalf of Met Engineers Ltd (a part of Met Consultancy Group)

The following documents are appended to this letter:

Appendix I	Supplementary Intrusive Site Investigation Location Plan
Appendix II	Borehole Logs
Appendix III	Photographs of Rock Cores
Appendix IV	Trial Pit Logs
Appendix V	Summary of Plate Load CBR Ground Conditions
Appendix VI	Plate Load CBR Testing Results
Appendix VII	Laboratory Testing Results



Appendix I

Supplementary Intrusive Site Investigation Location Plan





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 - To be read in conjunction with all relevant Engineer's, Architect's and Other drawings and specifications.
 - All building products to be used in strict accordance with the manufacturer's recommendations.
 - Any discrepancies are to be reported to the Engineer immediately.
 - Main Contractor to provide a detailed method statement for all works prior to commencement on site.

- = Rotary borehole location
- = Supplementary trial pit location
- = Plate load CBR testing location
- = High wall of opencast workings identified within TP102-b.

Issue	Date	Drawn	Description	CHK'd
03	02.01.24	YK	Supplementary intrusive investigation locations dated 14.12.2023-20.12.2023	--
02	24.05.23	TAW	Amended as per latest layout.	--
01	10.02.23	TAW	Initial proposal.	--



Met Engineers Ltd
 Southgate House
 Pontefract Road
 Stourton, Leeds
 West Yorkshire
 LS10 1SW
 Tel: 0113 200 8900
 Fax: 0113 200 8901
 email: admin@metengineers.com
 www.metengineers.com

Client
Barnsley Metropolitan Borough Council

Project
P22-01115 - Parkside Sports and Community Centre, Hoyland

Title
Proposed Site Layout and Additional Investigation Plan

Drawn	Checked	Date	Scale
TAW		10.02.23	A1

Drawing No
P22-01115-Met-M2-GE-002
 Version
3

Appendix II

Borehole Logs





Met Consultancy Group Ltd
 Southgate House
 Pontefract Road
 Leeds
 LS10 1SW
 Email: admin@metconsultancygroup.com
 Phone: 0113 200 8900

Borehole Log

Borehole No.

R001

Sheet 1 of 2

Project Name:	Parkside Sports and Community Centre, Hoyland	Project No.:	P22-01115	Co-ords:	435940510.00 - 399784710.00	Hole Type:	DS/OH/RC
Location:	Land between Sheffield Road and Stead Lane, Hoyland, Barnsley, S74 0AH	Level:	185.17	Scale:	1:24	Logged By:	YK
Client:	Barnsley Metropolitan Borough Council	Dates:	18/12/2023 - 19/12/2023				

Well	SPT (S)	Depth (m)	Type /FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description
				TCR	SCR	RQD				
	N=18 (3,3/4, 3,5,6)	0.00 - 0.45	LB				0.45	184.72		<p>MADE GROUND: Grass overlying medium brown partially mottled orange silty slightly sandy gravelly CLAY with occasional rootlets. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of siltstone, sandstone, mudstone and occasional limestone/chalk and brick. Fragment of wood noted. Assessed as soft to 0.20mbgl as finger pushed in by up to 10mm, and assessed as firm to 0.45mbgl as thumb makes impression easily.</p> <p>MADE GROUND: Orange mottled medium brown silty sandy gravelly CLAY. Sand is fine to medium. Gravel is angular to subangular fine to coarse of siltstone, sandstone, mudstone, chalk/limestone, coal and occasional brick. Assessed as very stiff, as can be indented by thumb nail only. Sandstone boulder obstruction noted at base. OPEN HOLED to confirm the base depth of the boulder obstruction. Boulder noted between 0.60mbgl-0.90mbgl. (QUARRY BACKFILL)</p>
		1.00 - 1.60	B				1.00	184.17		
		1.60 - 2.00	B				1.60	183.57		
	N=41 (2,4/7, 9,10,15)	2.00					2.00	183.17		<p>Wet medium brown slightly clayey sandy gravelly SILT. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of mixed lithologies. (QUARRY BACKFILL)</p> <p>Grey mottled brown silty sandy gravelly CLAY with a moderate to high cobble content. Sand is fine. Gravel is angular to subangular fine to coarse of mudstone, siltstone and coal. Cobbles are angular to subangular of mudstone and siltstone up to 80mm across. Assessed as firm as thumb makes impression easily. (QUARRY BACKFILL)</p> <p>Attempted UT100, terminated due to refusal on boulder obstruction. NO RECOVERY. (QUARRY BACKFILL)</p> <p>OPEN HOLED to confirm base depth of the boulder obstruction. Boulder noted between 2.20mbgl-2.40mbgl. (QUARRY BACKFILL)</p> <p>Orangish medium brown and grey thinly bedded SILTSTONE noted within SPT sample return. OPEN HOLED to 6.00mbgl to prove competent bedrock.</p>
		2.20					2.20	182.97		
		2.50					2.50	182.67		

Continued on Next Sheet

Remarks
 Hand dug to 0.60mbgl. Dynamic sampled between 0.60mbgl-6.00mbgl combined with open hole technique through boulder obstructions. Undertook core run between 6.00mbgl-7.50mbgl. Open holed between 7.50mbgl-8.00mbgl to confirm base of coal seam. Undertook SPT tests at depths of 1.00mbgl, 2.50mbgl, and 8.00mbgl. Attempted UT100 sampling at depth of 2.20mbgl, however this refused on boulder obstruction and no material was recovered due to nature of ground conditions.



Met Consultancy Group Ltd
 Southgate House
 Pontefract Road
 Leeds
 LS10 1SW
 Email: admin@metconsultancygroup.com
 Phone: 0113 200 8900

Borehole Log

Borehole No.

R002

Sheet 1 of 2

Project Name:	Parkside Sports and Community Centre, Hoyland	Project No.:	P22-01115	Co-ords:	435947800.00 - 399776920.00	Hole Type:	DS/OH
Location:	Land between Sheffield Road and Stead Lane, Hoyland, Barnsley, S74 0AH	Level:	184.76	Scale:	1:24	Logged By:	YK
Client:	Barnsley Metropolitan Borough Council	Dates:	14/12/2023 - 15/12/2023				

Well	SPT (S)	Depth (m)	Type /FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
		0.00 - 0.50	LB								
	▼						0.60	184.16		MADE GROUND: Grass overlying friable medium brown mottled orange silty sandy gravelly CLAY with rootlets noted. Sand is fine. Gravel is angular subangular fine to coarse of siltstone, mudstone, coal and occasional brick. Occasional fragments of ceramic and wood noted. Assessed as firm as thumb makes impression easily. Water seepage from noted 0.40mbgl. Mudstone boulder obstruction noted at 0.60mbgl. OPEN HOLED to confirm base depth of boulder obstruction. Boulder recorded between 0.60mbgl-1.00mbgl. (QUARRY BACKFILL)	1
	N=17 (3,2/4, 3,2,8)	1.30 - 1.85	B				1.30	183.46		SPT test undertaken at 1.30mbgl within quarry backfill, refusal noted on boulder obstruction. OPEN HOLED to confirm base depth of boulder obstruction. Boulder recorded between 1.45mbgl-2.20mbgl. (QUARRY BACKFILL)	2
	N=13 (2,2/2, 2,3,6)	2.20 - 3.00	B				2.20	182.56		Medium grey brown silty sandy gravelly CLAY with a low cobble content. Sand is fine. Gravel is angular to subangular fine to coarse of mixed lithologies including siltstone, mudstone and coal. Cobbles are angular to subangular of mudstone and siltstone up to 90mm across. Noted to be wet with twig and rootlets between 2.20mbgl-2.30mbgl. Assessed as soft between 2.20mbgl-2.30mbgl and 2.60mbgl-2.75mbgl as finger easily pushed in by up to 10mm. Assessed as stiff between 2.30mbgl-2.60mbgl and 2.75mbgl-3.00mbgl as can be indented slightly by thumb. Boulder obstruction noted at 3.00mbgl. (QUARRY BACKFILL)	3
		3.40 - 3.90	B				3.40	181.36		OPEN HOLED to confirm base depth of boulder obstruction. Boulder recorded between 3.00mbgl-3.30mbgl. (QUARRY BACKFILL)	
							3.90	180.86		Slightly wet grey silty sandy gravelly CLAY. Sand is fine. Gravel is angular to subangular fine to coarse of mudstone. Subangular cobble of mudstone 90mm across noted. Occasional fine relic rootlets noted. 0.20m of material recovered. (QUARRY BACKFILL) Refusal recorded at 3.90mbgl. OPEN HOLED to 9.00mbgl to prove competent bedrock. Grey thinly bedded MUDSTONE noted within sample return.	4
Continued on Next Sheet											

Remarks
 Hand dug to 0.60mbgl. Dynamic sampled between 0.60mbgl-3.90mbgl combined with open hole technique through boulder obstructions. Open holed between 3.90mbgl-9.00mbgl to confirm competent bedrock. Undertook SPT tests at depths of 1.3mbgl, 2.20mbgl and 9.00mbgl. No UT100's undertaken due to frequency of boulders.



Met Consultancy Group Ltd
 Southgate House
 Pontefract Road
 Leeds
 LS10 1SW
 Email: admin@metconsultancygroup.com
 Phone: 0113 200 8900

Borehole Log

Borehole No.

R002

Sheet 2 of 2

Project Name:	Parkside Sports and Community Centre, Hoyland	Project No.	P22-01115	Co-ords:	435947800.00 - 399776920.00	Hole Type	DS/OH
Location:	Land between Sheffield Road and Stead Lane, Hoyland, Barnsley, S74 0AH			Level:	184.76	Scale	1:24
Client:	Barnsley Metropolitan Borough Council			Dates:	14/12/2023 - 15/12/2023	Logged By	YK

Well	SPT (S)	Depth (m)	Type /FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
										Refusal recorded at 3.90mbgl. OPEN HOLED to 9.00mbgl to prove competent bedrock. Grey thinly bedded MUDSTONE noted within sample return.	5
											6
											7
											8
											9
	50 (25 for 80mm/ 50 for 110mm)						9.19	175.57		End of Borehole at 9.19m	

Remarks
 Hand dug to 0.60mbgl. Dynamic sampled between 0.60mbgl-3.90mbgl combined with open hole technique through boulder obstructions. Open holed between 3.90mbgl-9.00mbgl to confirm competent bedrock. Undertook SPT tests at depths of 1.3mbgl, 2.20mbgl and 9.00mbgl. No UT100's undertaken due to frequency of boulders.



Met Consultancy Group Ltd
 Southgate House
 Pontefract Road
 Leeds
 LS10 1SW
 Email: admin@metconsultancygroup.com
 Phone: 0113 200 8900

Borehole Log

Borehole No.

R003

Sheet 1 of 3

Project Name:	Parkside Sports and Community Centre, Hoyland	Project No.:	P22-01115	Co-ords:	435954730.00 - 399768310.00	Hole Type:	DS/OH/RC	
Location:	Land between Sheffield Road and Stead Lane, Hoyland, Barnsley, S74 0AH			Level:	184.41	Scale:	1:24	
Client:	Barnsley Metropolitan Borough Council			Dates:	15/12/2023 - 18/12/2023		Logged By:	YK

Well	SPT (S)	Depth (m)	Type /FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description
				TCR	SCR	RQD				
Well 1		0.00 - 0.60	LB							MADE GROUND: Grass overlying medium brown mottled orange silty sandy gravelly CLAY with occasional rootlets and a moderate cobble content. Sand is fine. Gravel is angular to subangular fine to coarse of siltstone, mudstone, coal, limestone/chalk and occasional brick. Cobbles are angular to subangular of siltstone/sandstone and mudstone up to 70mm across. Occasional twigs noted throughout. Assessed as soft to 0.30mbgl as finger pushed in up to 10mm, assessed as firm to 0.60mbgl as thumb makes impression easily. Cobble obstructions noted at base.
		0.60 - 1.10	B				0.60	183.81		Orangish mottled brown silty sandy gravelly CLAY with a moderate cobble content. Sand is fine, Gravel is angular to rounded fine to coarse of mixed lithologies including sandstone, siltstone, mudstone, limestone/chalk and coal. Cobbles are angular of siltstone and sandstone up to 90mm across. Relic rootlets noted. Assessed as very stiff as can only be indented by thumb nail. (QUARRY BACKFILL)
		1.10 - 1.60	B				1.10	183.31		Grey silty sandy gravelly friable CLAY with a high cobble content. Sand is fine. Gravel is angular to subangular fine to coarse of mudstone and occasional siltstone. Cobbles are angular to subangular of mudstone up to 110mm across. (QUARRY BACKFILL)
		1.60 - 1.90	B				1.60	182.81		Grey SAND and GRAVEL with a high cobble content. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of mudstone, occasional siltstone, and coal. Cobbles are angular to subangular of mudstone up to 70mm across. (QUARRY BACKFILL)
		1.90 - 2.20					1.90	182.51		Grey silty sandy gravelly friable CLAY with a very high cobble content. Sand is fine. Gravel is angular to subangular fine to coarse of mudstone and occasional siltstone. Cobbles are angular to subangular of mudstone up to 100mm across. Boulder obstruction noted at base. (QUARRY BACKFILL)
		2.20 - 2.50					2.20	182.21		OPEN HOLED to confirm base of boulder obstruction. Boulder noted between 2.20mbgl-2.50mbgl. (QUARRY BACKFILL)
		2.50 - 2.85	B				2.50	181.91		Wet medium brown silty slightly gravelly SAND sand is fine to coarse. Gravel is angular coarse of siltstone. (QUARRY BACKFILL)
		2.85 - 3.50	B				2.85	181.56		Grey silty sandy gravelly friable CLAY with a moderate cobble content. Sand is fine to medium. Gravel is angular to subangular fine to coarse of mudstone, siltstone and coal. Cobbles are subangular to rounded of mudstone up to 110mm across. Assessed as very stiff as clay can only be indented by thumb nail. (QUARRY BACKFILL)
		3.50 - 4.10					3.50	180.91		Attempted UT100. NO RECOVERY. (QUARRY BACKFILL)
		4.20 - 5.10	B				4.10	180.31		Grey silty sandy gravelly CLAY with a moderate to high cobble content. Sand is fine

Remarks
 Hand dug to 0.60mbgl. Dynamic sampled between 0.60mbgl-7.10mbgl combined with open hole technique through boulder obstructions. Bedrock identified at top depth of 7.10mbgl. Open holed between 7.10mbgl-10.50mbgl to confirm competent bedrock. Undertook core run between 10.5mbgl-12.00mbgl. Undertook SPT tests at depths of 5.10mbgl, 8.00mbgl and 12.00mbgl. Attempted UT100's at depths of 3.50mbgl, 4.00mbgl and 6.50mbgl, however no material was recovered due to nature of ground conditions, and the final UT100 attempt terminated due to refusal on boulder obstruction.

Continued on Next Sheet



Met Consultancy Group Ltd
 Southgate House
 Pontefract Road
 Leeds
 LS10 1SW
 Email: admin@metconsultancygroup.com
 Phone: 0113 200 8900

Borehole Log

Borehole No.

R003

Sheet 2 of 3

Project Name:	Parkside Sports and Community Centre, Hoyland	Project No.:	P22-01115	Co-ords:	435954730.00 - 399768310.00	Hole Type:	DS/OH/RC	
Location:	Land between Sheffield Road and Stead Lane, Hoyland, Barnsley, S74 0AH			Level:	184.41	Scale:	1:24	
Client:	Barnsley Metropolitan Borough Council			Dates:	15/12/2023 - 18/12/2023		Logged By:	YK

Well	SPT (S)	Depth (m)	Type /FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description		
				TCR	SCR	RQD						
50 (25 for 60mm/ 50 for 20mm)		5.80 - 6.50	B				5.10	179.31		Grey silty sandy gravelly CLAY with a moderate to high cobble content. Sand is fine to medium. Gravel is angular to subangular fine to coarse of mudstone and occasional siltstone and coal. Cobbles are angular to subangular of mudstone up to 100mm across. Assessed as very stiff as can only be indented by a thumb nail. (QUARRY BACKFILL)	5	
							5.50	178.91				OPEN HOLED to confirm base of boulder obstruction. Boulder noted between 5.10mbgl-5.40mbgl. (QUARRY BACKFILL)
							5.80	178.61				Wet grey very clayey sandy very gravelly SILT. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of mudstone. Singular subrounded cobble of mudstone 70mm across noted. (QUARRY BACKFILL)
							6.50	177.91				Grey silty sandy gravelly CLAY with a moderate to high cobble content. Sand is fine. Gravel is angular to subangular fine to coarse of mudstone and occasional siltstone. Cobbles are angular to subangular of mudstone up to 90mm across. (QUARRY BACKFILL)
							7.10	177.31				Attempted UT100 at 6.50mbgl. Terminated due to refusal on boulder obstruction. NO RECOVERY. OPEN HOLED from 6.50mbgl to confirm base of boulder obstruction. Boulder noted between 6.50mbgl-6.80mbgl. (QUARRY BACKFILL)
50 (25 for 30mm/ 50 for 40mm)										Bedrock identified at top depth of 7.10mbgl. OPEN HOLE continued to 10.50mbgl to confirm competent bedrock. Grey thinly bedded MUDSTONE noted within SPT sample return.	7	
Continued on Next Sheet												

Remarks
 Hand dug to 0.60mbgl. Dynamic sampled between 0.60mbgl-7.10mbgl combined with open hole technique through boulder obstructions. Bedrock identified at top depth of 7.10mbgl. Open holed between 7.10mbgl-10.50mbgl to confirm competent bedrock. Undertook core run between 10.5mbgl-12.00mbgl. Undertook SPT tests at depths of 5.10mbgl, 8.00mbgl and 12.00mbgl. Attempted UT100's at depths of 3.50mbgl, 4.00mbgl and 6.50mbgl, however no material was recovered due to nature of ground conditions, and the final UT100 attempt terminated due to refusal on boulder obstruction.



Met Consultancy Group Ltd
 Southgate House
 Pontefract Road
 Leeds
 LS10 1SW
 Email: admin@metconsultancygroup.com
 Phone: 0113 200 8900

Borehole Log

Borehole No.

R003

Sheet 3 of 3

Project Name:	Parkside Sports and Community Centre, Hoyland	Project No.:	P22-01115	Co-ords:	435954730.00 - 399768310.00	Hole Type:	DS/OH/RC
Location:	Land between Sheffield Road and Stead Lane, Hoyland, Barnsley, S74 0AH	Level:	184.41	Scale:	1:24	Logged By:	YK
Client:	Barnsley Metropolitan Borough Council	Dates:	15/12/2023 - 18/12/2023				

Well	SPT (S)	Depth (m)	Type /FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
50 (25 for 125m m/50 for 115mm)							10.50	173.91		Bedrock identified at top depth of 7.10mbgl. OPEN HOLE continued to 10.50mbgl to prove competent bedrock. Grey thinly bedded MUDSTONE noted within SPT sample return.	10
		10.50 - 12.00	20	63	17	0				Grey thinly bedded highly fractured distinctly weathered MUDSTONE. 0.10m of strata at base of core run recorded to be clayey. Generally recovered as angular to subangular coarse gravels and cobbles of mudstone. Assessed as weak as can be peeled with a pocket knife with difficulty, and shallow indentations made by firm blows of geological hammer.	11
							12.20	172.21		End of Borehole at 12.20m	12
											13
											14

Remarks
 Hand dug to 0.60mbgl. Dynamic sampled between 0.60mbgl-7.10mbgl combined with open hole technique through boulder obstructions. Bedrock identified at top depth of 7.10mbgl. Open holed between 7.10mbgl-10.50mbgl to confirm competent bedrock. Undertook core run between 10.5mbgl-12.00mbgl. Undertook SPT tests at depths of 5.10mbgl, 8.00mbgl and 12.00mbgl. Attempted UT100's at depths of 3.50mbgl, 4.00mbgl and 6.50mbgl, however no material was recovered due to nature of ground conditions, and the final UT100 attempt terminated due to refusal on boulder obstruction.



Met Consultancy Group Ltd
 Southgate House
 Pontefract Road
 Leeds
 LS10 1SW
 Email: admin@metconsultancygroup.com
 Phone: 0113 200 8900

Borehole Log

Borehole No.

R004

Sheet 1 of 2

Project Name:	Parkside Sports and Community Centre, Hoyland	Project No.:	P22-01115	Co-ords:	435945910.00 - 399760000.00	Hole Type:	DS/OH/RC
Location:	Land between Sheffield Road and Stead Lane, Hoyland, Barnsley, S74 0AH	Level:	184.58	Scale:	1:24	Logged By:	YK
Client:	Barnsley Metropolitan Borough Council	Dates:	18/12/2023				

Well	SPT (S)	Depth (m)	Type /FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description
				TCR	SCR	RQD				
	N=39 (4,6/39 for 230m m)	0.00 - 0.65	LB				0.65	183.93		<p>MADE GROUND: Grass overlying medium brown mottled orange silty slightly sandy gravelly CLAY with a moderate cobble content and rootlets. Sand is fine. Gravel is angular to subangular fine to coarse of mixed lithologies including mudstone, sandstone, siltstone, coal, chalk/limestone, and occasional brick. Cobbles are angular to subangular to siltstone/sandstone up to 150mm across. Assessed as soft to 0.15mbgl as finger pushed in up to 10mm, and assessed as firm to 0.65mbgl as thumb makes impression easily. Water seepage noted at 0.40mbgl.</p> <p>REWORKED GROUND: Orangish mottled brown grey silty sandy gravelly CLAY with a low cobble content. Sand is fine. Gravel is angular to subangular fine to coarse of mixed lithologies including sandstone, siltstone, mudstone, and coal. Cobbles are angular to subangular to siltstone/sandstone up to 150mm across. Assessed as very stiff as thumbnail makes indent only. Sandstone cobble obstructions noted at base.</p> <p>REWORKED GROUND: Orangish mottled grey silty slightly sandy gravelly CLAY with a moderate cobble content. Sand is fine. Gravel is angular to subangular fine to coarse of mixed lithologies including siltstone, mudstone, coal, and limestone/chalk. Cobbles are angular to subangular of sandstone, siltstone, and brick up to 80mm across. Assessed as stiff as thumb makes slight imprint.</p> <p>REWORKED GROUND: Orangish medium brown with grey fissures silty sandy slightly gravelly CLAY with a moderate to high cobble content. Sand is fine. Gravel is angular to subrounded fine to coarse of siltstone/mudstone and coal. Cobbles are angular to subangular of siltstone/sandstone up to 120mm. Assessed as stiff as thumb makes slight imprint.</p> <p>Orangish brown and medium to dark brown thinly bedded highly fractured distinctly weathered SILTSTONE/SANDSTONE. Recovered as gravels between 1.90mbgl-2.15mbgl. Assessed as extremely weak as can be indented by thumbnail and gravel sized lumps can be crushed between thumb and finger.</p> <p>OPEN HOLED to prove competent bedrock.</p>
							0.80	183.78		
							1.30	183.28		
							1.85	182.73		
		2.15 - 3.65	20	83	35	0	3.65	180.93		

Continued on Next Sheet

Remarks
 Hand dug to 0.80mbgl. Dynamic sampled between 0.80mbgl-2.15mbgl. Undertook core runs between 2.15mbgl-3.65mbgl and 6.00mbgl-7.50mbgl, combined with open hole technique between 3.65mbgl-6.00mbgl to prove competent bedrock. Undertook SPT tests at depths of 1.90mbgl and 7.50mbgl. No UT100's undertaken due to shallow bedrock. Depth of coal seam between 6.02mbgl-6.20mbgl approximated due to length of recovered core.



Met Consultancy Group Ltd
 Southgate House
 Pontefract Road
 Leeds
 LS10 1SW
 Email: admin@metconsultancygroup.com
 Phone: 0113 200 8900

Borehole Log

Borehole No.

RC01

Sheet 2 of 5

Project Name:	Parkside Sports and Community Centre, Hoyland	Project No.:	P22-01115	Co-ords:	435921840.00 - 399785990.00	Hole Type:	RC
Location:	Land between Sheffield Road and Stead Lane, Hoyland, Barnsley, S74 0AH	Level:	185.61	Scale:	1:24	Logged By:	YK
Client:	Barnsley Metropolitan Borough Council	Dates:	19/12/2023 - 20/12/2023				

Well	SPT (S)	Depth (m)	Type /FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
Well 1							5.00	180.61	XXXXXXXXXX XXXXXXXXXX XXXXXXXXXX XXXXXXXXXX XXXXXXXXXX	Grey thinly bedded distinctly weathered clayey MUDSTONE with orange staining noted, particularly within bedding planes. Recovered as clayey gravels between 3.90mbgl-4.05mbgl and 4.40mbgl-4.45mbgl. Assessed as extremely weak as finger nail indented easily.	5
							5.40	180.21		Black shiny COAL, partially recovered as gravels.	
							5.80	179.81		Grey thinly bedded moderately fractured distinctly weathered very clayey MUDSTONE. Assessed as extremely weak as can be indented by thumbnail.	
	5.40 - 6.90	12	77	53	19	6.00	179.61		Black shiny COAL, recovered as gravels. Pyrite mineralisation noted within coal. Occasional coal gravels displaying iridescent sheen noted associated with 'peacock coal' effect.	6	
						6.90	178.71		Grey thinly bedded moderately fractured partially unweathered MUDSTONE. Assessed as weak as can be peeled with a pocket knife with difficulty.		
		6.90 - 8.40	17	87	68	7	8.40	177.21		Grey thinly bedded moderately fractured distinctly weathered MUDSTONE. Intermittent ripple features noted throughout. Recorded as clayey between 7.25mbgl-7.27mbgl, with clayey gravels of mudstone noted within fracture at 7.95mbgl. Assessed as very weak as can be peeled with a pocket knife.	7
		8.40 - 9.90	16	60	17	0				Grey thinly bedded highly fractured distinctly weathered MUDSTONE. Recovered as wet soft clayey mudstone gravels between 8.40mbgl-8.45mbgl, and 0.40m of slightly clayey mudstone gravels at base of core run. Assessed as very weak as cannot be indented by thumbnail but can easily be peeled with a pocket knife.	9
Continued on Next Sheet											

Remarks
 Hand dug to 0.90mbgl. Core runs undertaken between 0.90mbgl-15.00mbgl. Open holed between 15.00mbgl-20.00mbgl. Undertook SPT's at depths of 2.40mbgl and 15.00mbgl. Depths within core run descriptions approximated due to lengths of recovered cores.



Met Consultancy Group Ltd
 Southgate House
 Pontefract Road
 Leeds
 LS10 1SW
 Email: admin@metconsultancygroup.com
 Phone: 0113 200 8900

Borehole Log

Borehole No.

RC01

Sheet 3 of 5

Project Name:	Parkside Sports and Community Centre, Hoyland	Project No.:	P22-01115	Co-ords:	435921840.00 - 399785990.00	Hole Type:	RC
Location:	Land between Sheffield Road and Stead Lane, Hoyland, Barnsley, S74 0AH	Level:	185.61	Scale:	1:24	Logged By:	YK
Client:	Barnsley Metropolitan Borough Council	Dates:	19/12/2023 - 20/12/2023				

Well	SPT (S)	Depth (m)	Type /FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
Well 1							9.90	175.71		Grey thinly bedded highly fractured distinctly weathered MUDSTONE. Recovered as wet soft clayey mudstone gravels between 8.40mbgl-8.45mbgl, and 0.40m of slightly clayey mudstone gravels at base of core run. Assessed as very weak as cannot be indented by thumbnail but can easily be peeled with a pocket knife.	10
		9.90 - 11.40	20	70	30	9				Grey thinly bedded highly fractured distinctly weathered MUDSTONE. Clayey mudstone gravels noted 0.50m from the base of core run. Assessed as very weak as it cannot be indented by thumbnail but can easily be peeled with a pocket knife.	11
							11.40	174.21		Grey thinly bedded highly fractured distinctly weathered MUDSTONE. Bivalve fossils noted between 11.85mbgl-11.90mbgl. Assessed as very weak as it cannot be indented by thumbnail but can easily be peeled with a pocket knife.	
		11.40 - 12.90	25	80	32	13	12.00	173.61		Shiny black COAL, partially recovered as gravels from 12.00mbgl-12.05mbgl and 12.35mbgl-12.40mbgl. Pyrite mineralisation noted within coal.	12
							12.40	173.21		Grey thinly bedded highly fractured distinctly weathered MUDSTONE. Assessed as very weak as it cannot be indented by thumbnail but can easily be peeled with a pocket knife.	
							12.50	173.11		Shiny black COAL, recovered as gravels.	
						12.55	173.06		Grey thinly bedded highly fractured distinctly weathered MUDSTONE. Assessed as very weak as it cannot be indented by thumbnail but can easily be peeled with a pocket knife.		
						12.90	172.71		Grey thinly bedded highly fractured distinctly weathered MUDSTONE. Assessed as very weak as it cannot be indented by thumbnail but can easily be peeled with a pocket knife.	13	
	12.90 - 13.70	13	100	93	0				Grey thinly bedded moderately fractured, distinctly weathered to 13.05mbgl, partially unweathered for remainder of core run, MUDSTONE. Intermittent ripple features noted throughout. Assessed as weak as can be peeled with a pocket knife with difficulty.		
						13.70	171.91		Grey thinly bedded low to moderately fractured partially unweathered MUDSTONE. 0.10m of ripple features noted at base of core run. Assessed as weak as can be peeled with a pocket knife with difficulty.	14	
	13.70 - 15.00	9	100	78	60						

Continued on Next Sheet

Remarks

Hand dug to 0.90mbgl. Core runs undertaken between 0.90mbgl-15.00mbgl. Open holed between 15.00mbgl-20.00mbgl. Undertook SPT's at depths of 2.40mbgl and 15.00mbgl. Depths within core run descriptions approximated due to lengths of recovered cores.



Met Consultancy Group Ltd
 Southgate House
 Pontefract Road
 Leeds
 LS10 1SW
 Email: admin@metconsultancygroup.com
 Phone: 0113 200 8900

Borehole Log

Borehole No.

RC01

Sheet 4 of 5

Project Name:	Parkside Sports and Community Centre, Hoyland	Project No.:	P22-01115	Co-ords:	435921840.00 - 399785990.00	Hole Type:	RC
Location:	Land between Sheffield Road and Stead Lane, Hoyland, Barnsley, S74 0AH	Level:	185.61	Scale:	1:24	Logged By:	YK
Client:	Barnsley Metropolitan Borough Council	Dates:	19/12/2023 - 20/12/2023				

Well	SPT (S)	Depth (m)	Type /FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
	50 (25 for 35mm/ 50 for 25mm)						15.00	170.61		Grey thinly bedded low to moderately fractured partially unweathered MUDSTONE. 0.10m of ripple features noted at base of core run. Assessed as weak as can be peeled with a pocket knife with difficulty.	15
										OPEN HOLED to confirm competent bedrock. MUDSTONE.	16
											17
											18
											19

Continued on Next Sheet

Remarks
 Hand dug to 0.90mbgl. Core runs undertaken between 0.90mbgl-15.00mbgl. Open holed between 15.00mbgl-20.00mbgl. Undertook SPT's at depths of 2.40mbgl and 15.00mbgl. Depths within core run descriptions approximated due to lengths of recovered cores.



Met Consultancy Group Ltd
 Southgate House
 Pontefract Road
 Leeds
 LS10 1SW
 Email: admin@metconsultancygroup.com
 Phone: 0113 200 8900

Borehole Log

Borehole No.

RC01

Sheet 5 of 5

Project Name:	Parkside Sports and Community Centre, Hoyland	Project No.:	P22-01115	Co-ords:	435921840.00 - 399785990.00	Hole Type:	RC
Location:	Land between Sheffield Road and Stead Lane, Hoyland, Barnsley, S74 0AH	Level:	185.61	Scale:	1:24	Logged By:	YK
Client:	Barnsley Metropolitan Borough Council	Dates:	19/12/2023 - 20/12/2023				

Well	SPT (S)	Depth (m)	Type /FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
							20.00	165.61		OPEN HOLED to confirm competent bedrock. MUDSTONE.	20
										End of Borehole at 20.00m	21
											22
											23
											24

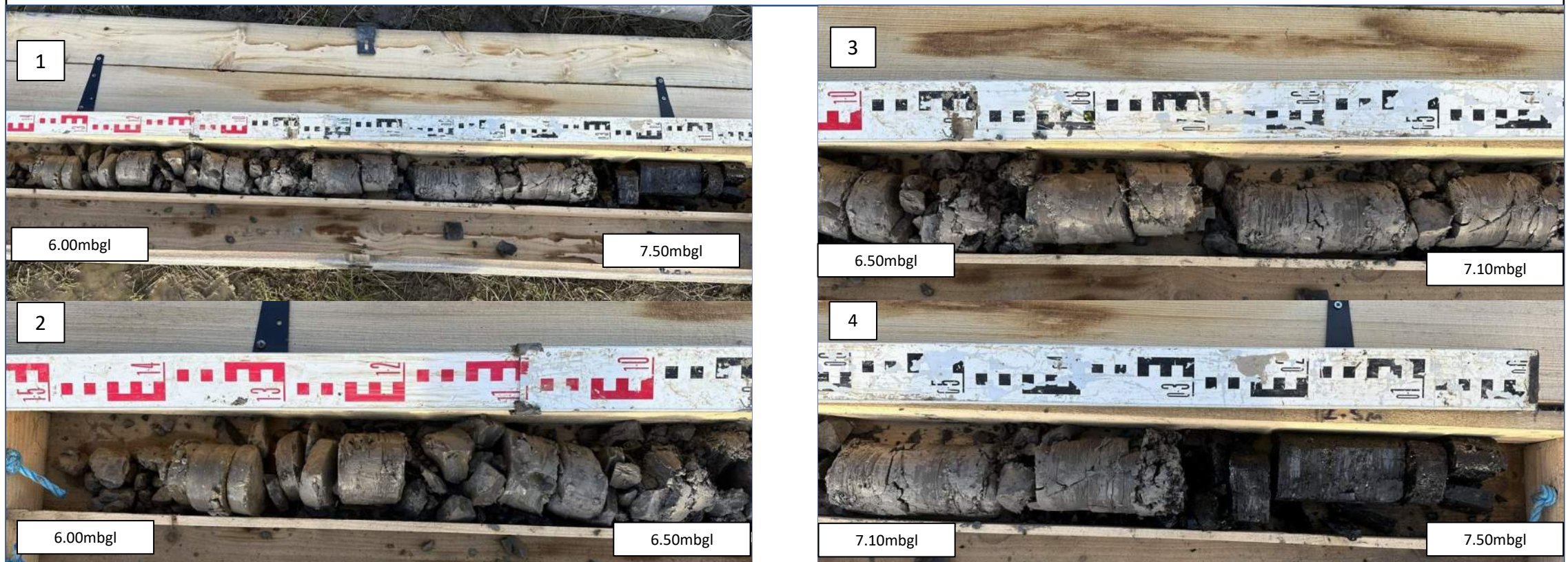
Remarks
 Hand dug to 0.90mbgl. Core runs undertaken between 0.90mbgl-15.00mbgl. Open holed between 15.00mbgl-20.00mbgl. Undertook SPT's at depths of 2.40mbgl and 15.00mbgl. Depths within core run descriptions approximated due to lengths of recovered cores.

Appendix III

Photographs of Rock Cores



RO01 CORE 6.00-7.50mbgl



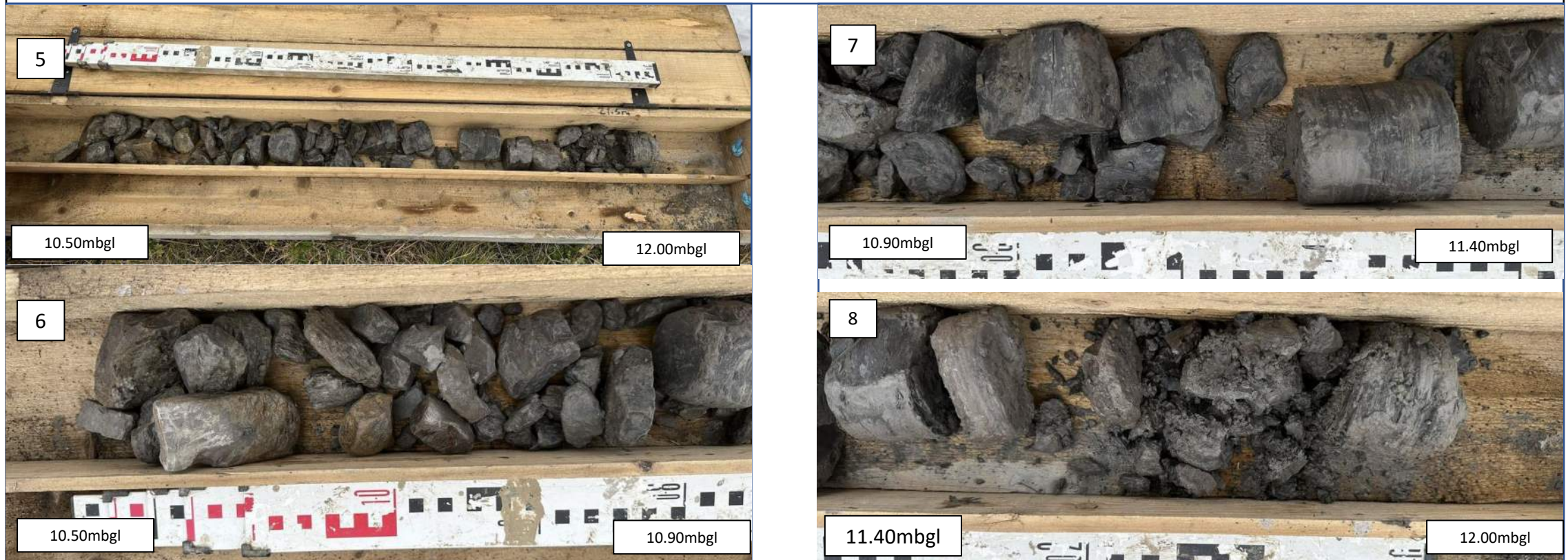
Photograph 1: Wide angle view of RO01 core 6.00-7.50mbgl

Photograph 2: View of RO01 core approximate depth of 6.00-6.50mbgl

Photograph 3: View of RO01 core approximate depth of 6.50-7.10mbgl

Photograph 4: View of RO01 core approximate depth of 7.10-7.50mbgl. Coal noted at top depth of 7.20mbgl to base of core run.

RO03 CORE 10.50-12.00mbgl



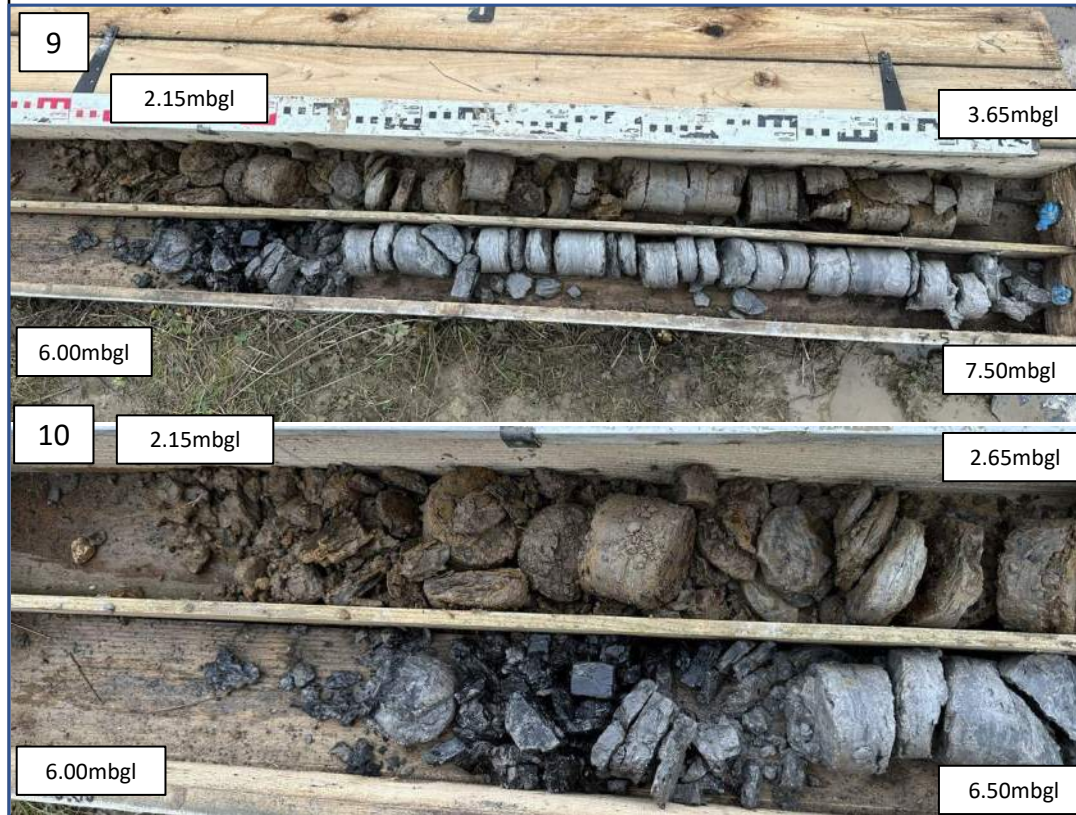
Photograph 5: Wide angle view of RO03 core 10.50-12.00mbgl.

Photograph 7: View of RO03 core approximate depth of 10.90-11.40mbgl.

Photograph 6: View of RO03 core approximate depth of 10.50-10.90mbgl, potential back filled material.

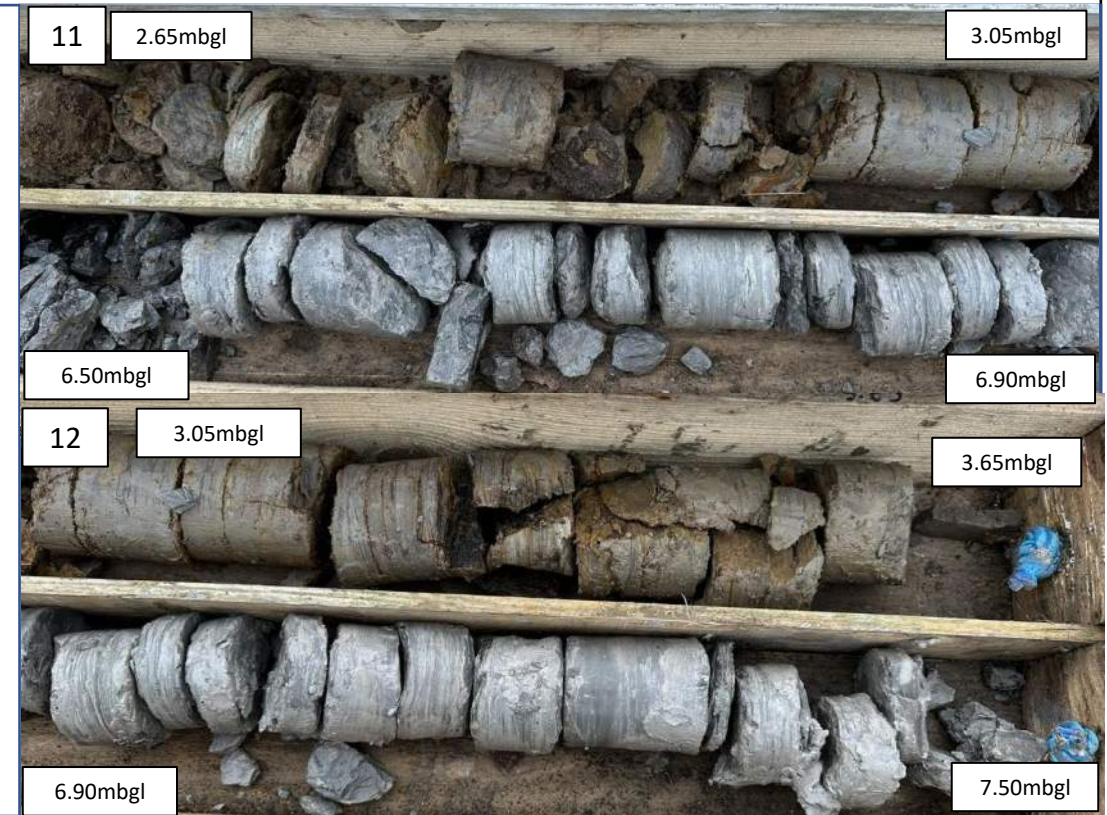
Photograph 8: View of RO03 core approximate depth of 11.40-12.00mbgl, poor recovery.

RO04 CORES 2.15-3.65mbgl and 6.00-7.50mbgl



Photograph 9: Wide angle view of RO04 cores 2.15-3.65mbgl (top) and 6.00-7.50mbgl (bottom).

Photograph 10: View of RO04 cores approximate depths of 2.15-2.65mbgl (top) and 6.00-6.50mbgl (bottom). Coal noted within bottom core



Photograph 11: View of RO04 cores approximate depths of 2.65-3.05mbgl (top) and 6.50-6.90mbgl (bottom).

Photograph 12: View of RO04 cores approximate depths of 3.05-3.65mbgl (top) and 6.90-7.50mbgl (bottom).

RC01 CORE 2.40-3.90mbgl



Photograph 13: Wide angle view of RC01 core 2.40-3.90mbgl (poor recovery).

Photograph 14: View of RC01 core approximately first half of the core run.

Photograph 15: View of RC01 core approximately the second half of the core run.

RC01 CORE 3.90-5.40mbgl



Photograph 16: Wide angle view of RC01 core 3.90-5.40mbgl. Core within plastic liner in the photograph.

Photograph 17: View of RC01 core approximate depth of 3.90-4.30mbgl.

Photograph 18: View of RC01 core approximate depth of 4.30-4.80mbgl.

Photograph 19: View of RC01 core approximate depth of 4.80-5.40mbgl. Coal seam noted at top depth of 5.00mbgl to base of core run.

RC01 CORES 5.40-6.90mbgl and 6.90-8.40mbgl



Photograph 20: Wide angle view of RC01 cores 5.40-6.90mbgl (top) and 6.90-8.40mbgl (bottom).

Photograph 21: View of RC01 cores of first third of core runs with top depths of 5.40mbgl (top) and 6.90mbgl (bottom).



Photograph 22: View of middle third of RC01 cores. 0.20m thick coal seam noted at approximate top depth of 5.80mbgl.

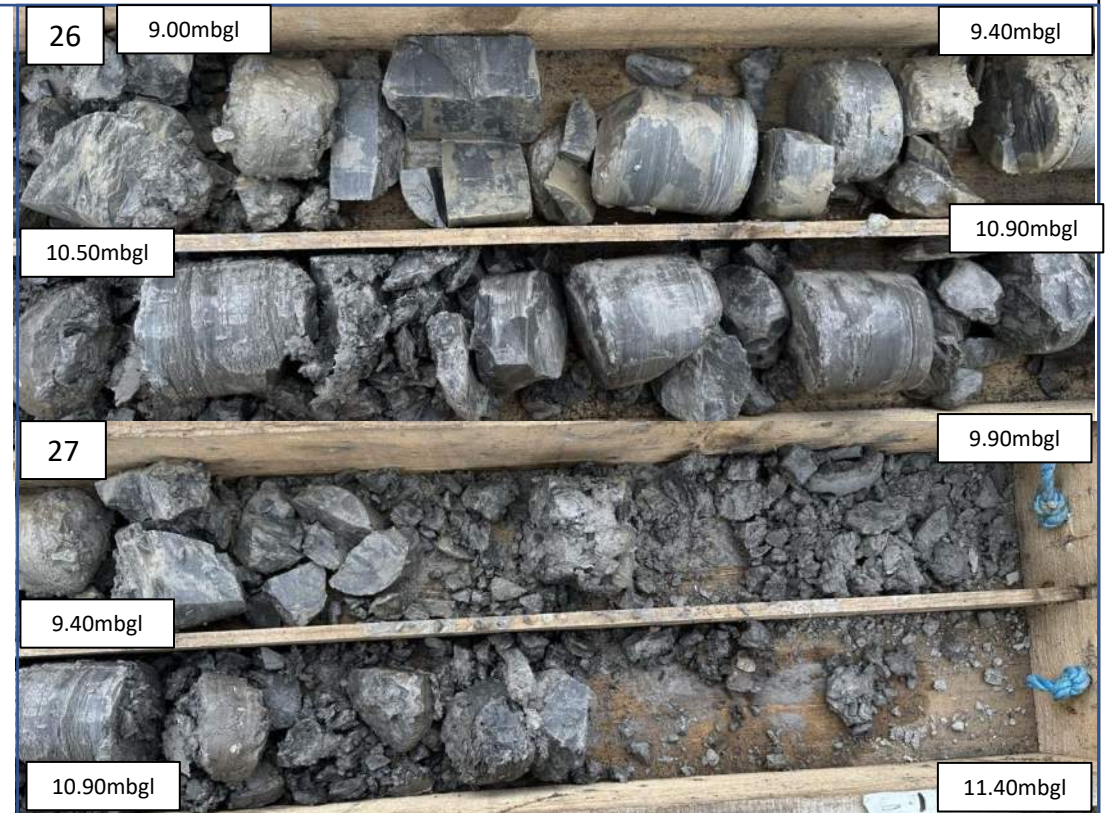
Photograph 23: View of RC01 cores of last third of core runs with bottom depths of 6.90mbgl (top) and 8.40mbgl (bottom).

RC01 CORES 8.40-9.90mbgl and 9.90-11.40mbgl



Photograph 24: Wide angle view of RC01 cores 8.40-9.90mbgl (top) and 9.90-11.40 (bottom).

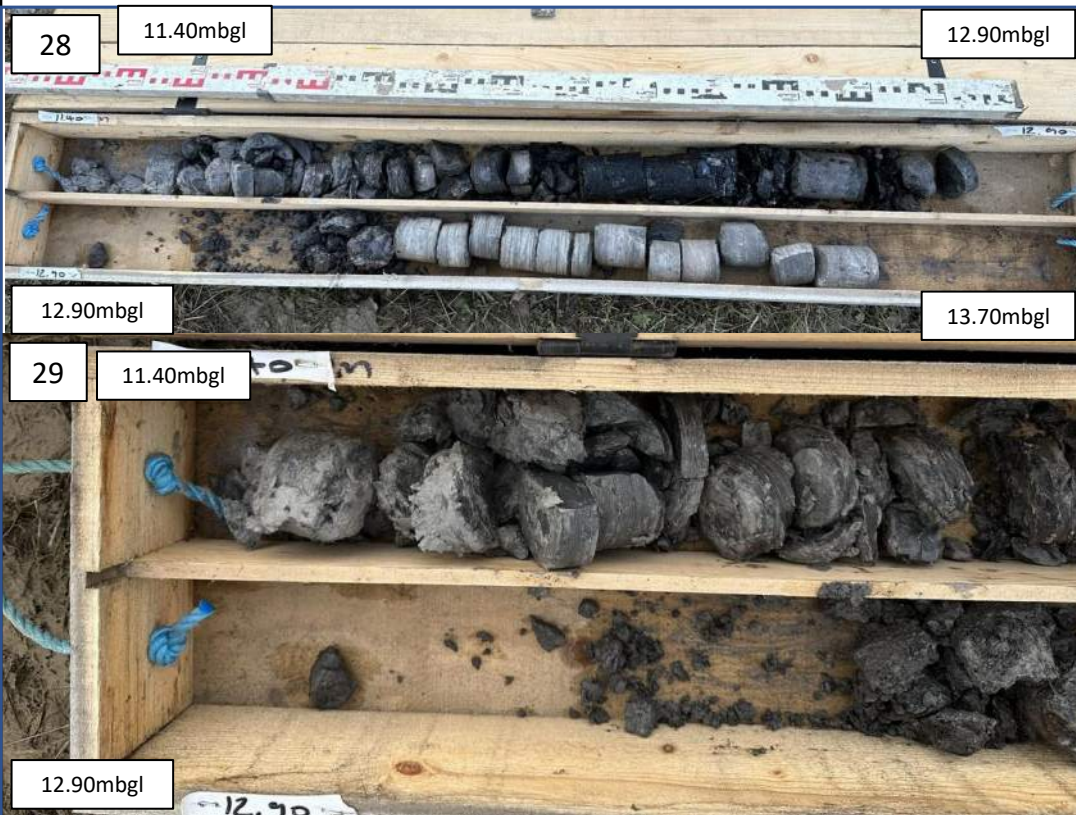
Photograph 25: View of RC01 cores approximate depths of 8.40-9.00mbgl (top) and 9.90-10.50 (bottom).



Photograph 26: View of RC01 cores approximate depths of 9.00-9.40mbgl (top) and 10.50-10.90 (bottom).

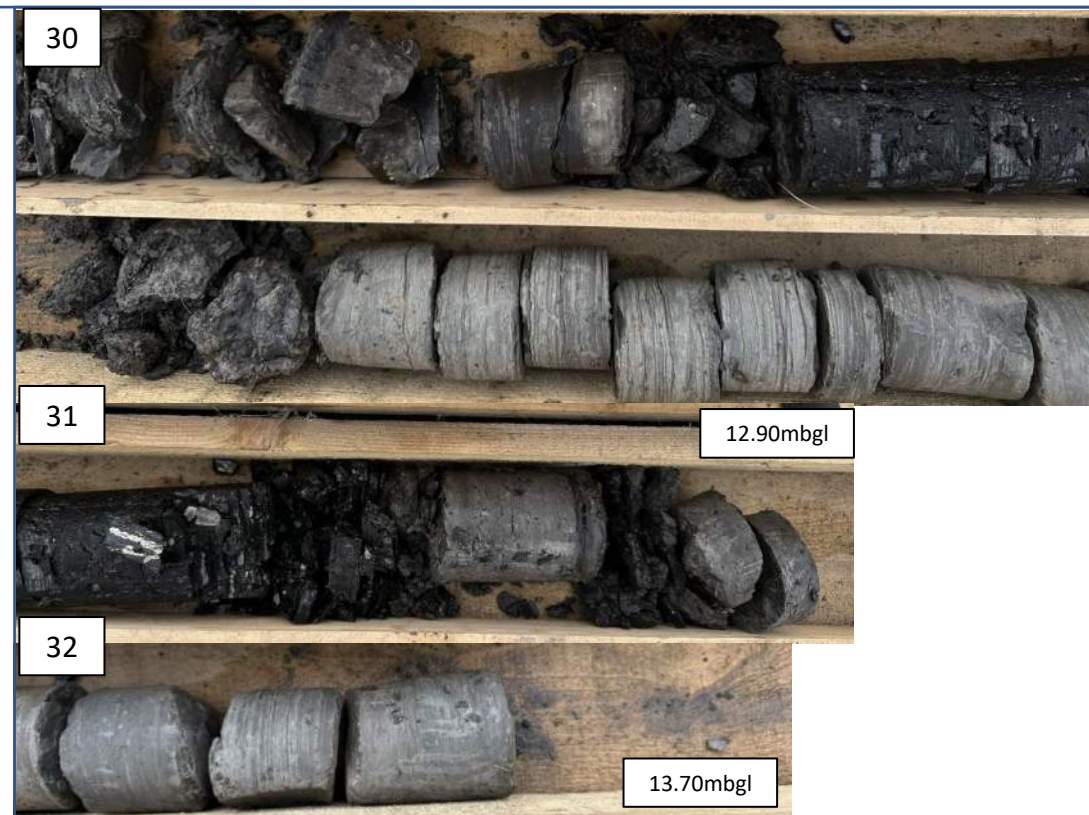
Photograph 27: View of RC01 cores approximate depths of 9.40-9.90mbgl (top) and 10.90-11.40 (bottom).

RC01 CORES 11.40-12.90mbgl and 12.90-13.70mbgl



Photograph 28: Wide angle view of RC01 cores 11.40-12.90mbgl (top) and 12.90-13.70mbgl (bottom).

Photograph 29: View of RC01 cores at top depths of 8.40-9.00mbgl (top) and 9.90-10.50 (bottom).



Photograph 30: View of approximate middle section of RC01 core runs. Coal seam noted in core run (top) at approximate top depth of 12.00mbgl

Photograph 31: View of RC01 core at bottom depth of 12.90mbgl. Coal gravels noted in core run at approximate top depth of 12.50mbgl.

Photograph 32: View of RC01 core at bottom depth of 13.70mbgl (bottom).

RC01 CORE 13.70-15.00mbgl



Photograph 33: Wide angle view of RC01 core 13.70-15.00mbgl.

Photograph 35: View of approximately second quarter of RC01 core run.

Photograph 34: View of first quarter of RC01 core run at top depth of 13.70mbgl.

Photograph 36: View of approximately third quarter of RC01 core run.

Photograph 37: View of last quarter of RC01 core run at bottom depth of 15.00mbgl.

Appendix IV

Trial Pit Logs





Met Consultancy Group Ltd
 Southgate House
 Pontefract Road
 Leeds
 LS10 1SW
 Email: admin@metconsultancygroup.com
 Phone: 0113 200 8900

Trial Pit Log

Trial Pit No
 TP101
 Sheet 1 of 1

Project Name: Parkside Sports and Community Centre, Hoyland
 Project No.: P22-01115
 Co-ords: 435908668.00 - 399784322.00
 Level: 186.16
 Date: 18/12/2023

Location: Land between Sheffield Road and Stead Lane, Hoyland, Barnsley, S74 0AH
 Dimensions (m): 6.00
 Scale: 1:25

Client: Barnsley Metropolitan Borough Council
 Depth: 2.10
 Logged: YK

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.40	185.76		MADE GROUND: Grass overlying medium brown silty slightly sandy gravelly CLAY with frequent rootlets. Sand is fine. Gravel is angular to subangular fine to coarse of mixed lithologies including sandstone, mudstone, siltstone, chalk/limestone, brick and coal. Round rubber object and loose twigs noted. Assessed as firm as thumb makes imprint easily. (TOPSOIL)
				0.50	185.66		
				0.70	185.46		FILL: Cream angular to subangular fine to coarse gravels of limestone and chalk.
							Dark brown silty SAND with frequent rootlets. Sand is fine to medium. Potential relic topsoil.
	1.00		HVR=66				REWORKED GROUND: Orangish mottled grey silty sandy slightly gravelly CLAY with a moderate cobble and boulder content, and occasional roots and rootlets. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone and siltstone. Cobbles and boulders are angular to subangular of sandstone and siltstone up to 450mm across. Assessed as firm as thumb makes impression easily.
	1.00		HVR=82	1.10	185.06		
	1.00		HVR=82				
							Light brown with friable grey fissures very silty sandy slightly gravelly CLAY. Sand is fine. Gravel is angular to subangular fine of siltstone, mudstone, sandstone and coal. Assessed as very stiff as can only be indented by thumbnail. Potential destructured bedrock.
				2.00	184.16		Medium brown SILTSTONE. Recovered as angular cobbles and boulders of thinly bedded siltstone up to 250mm across within a silty sandy matrix.
				2.10	184.06		
							End of Pit at 2.10m

Remarks: Trial pit terminated due to refusal on bedrock.

Stability: Stable Weather: Overcast

Trial Pit Photos

TP101

Parkside Sports and
Community Centre, Hoyland

P22-01115



Photograph 01: Trial pit TP101. View of trial pit from south east to north west.



Photograph 02: Trial pit TP101. Northern side, eastern side, and base of trial pit. View from south west to north east.

Trial Pit Photos

TP101

Parkside Sports and
Community Centre, Hoyland

P22-01115



Photograph 03: Trial pit TP101. Southern side, eastern side, and base of trial pit. View from north west to south east.



Photograph 04: Trial pit TP101. Trial pit arisings (1). View from north west to south east.

Trial Pit Photos

TP101

Parkside Sports and
Community Centre, Hoyland

P22-01115



Photograph 05: Trial pit TP101. Trial pit arisings (2). View from south east to north west.



Met Consultancy Group Ltd
 Southgate House
 Pontefract Road
 Leeds
 LS10 1SW
 Email: admin@metconsultancygroup.com
 Phone: 0113 200 8900

Trial Pit Log

Trial Pit No
 TP102A
 Sheet 1 of 1

Project Name: Parkside Sports and Community Centre, Hoyland
 Project No: P22-01115
 Co-ords: 435963657.00 - 399741116.00
 Level: 183.20
 Date: 19/12/2023

Location: Land between Sheffield Road and Stead Lane, Hoyland, Barnsley, S74 0AH
 Dimensions (m): 4.00
 Scale: 1:25

Client: Barnsley Metropolitan Borough Council
 Depth: 1.75
 Logged: YK

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.30 0.30 0.30		HVR=31 HVR=45 HVR=53	0.40	182.80		Grass overlying medium brown silty sandy slightly gravelly CLAY with frequent rootlets. Sand is fine. Gravel is angular fine to coarse of mixed lithologies including sandstone, mudstone, coal, limestone, and chalk. Assessed as soft as finger easily pushed in by up to 10mm. (TOPSOIL)
	0.80 - 1.10 0.85 0.85 0.85	B	HVR=126 HVR=163 HVR=172	1.10	182.10		REWORKED GROUND: Orange mottled grey silty sandy slightly gravelly CLAY with moderate cobble and boulder content. Sand is fine. Gravel is angular to subangular fine to coarse of sandstone siltstone, mudstone and coal. Cobbles and boulders are angular to subangular of siltstone/sandstone up to 250mm across. Assessed as firm as thumb makes impression easily. Assessed as high to very high strength from 0.85mbgl based on shear vane results.
				1.75	181.45		Orangish medium brown thinly bedded SILTSTONE. Recovered as angular cobbles and boulders of thinly bedded siltstone up to 280mm across within a silty sandy matrix.
							End of Pit at 1.75m

Remarks: Trial pit extended to the north east to identify the high wall of opencast quarry, ground conditions summarised within TP102B log. Trial pit terminated due to refusal on bedrock.

Stability: Stable Weather: Overcast

Trial Pit Photos

TP102A

Parkside Sports and
Community Centre, Hoyland

P22-01115



Photograph 06: Trial pit TP102A. View of trial pit from south west to north east.



Photograph 07: Trial pit TP102A. Northern side, western side, and base of trial pit.
View from south east to north west.

Trial Pit Photos

TP102A

Parkside Sports and
Community Centre, Hoyland

P22-01115



Photograph 08: Trial pit TP102A. Northern and eastern sides of trial pit. View from south west to north east.



Photograph 09: Trial pit TP102A. Trial pit topsoil arisings (1). View from south west to north east.

Trial Pit Photos

TP102A

Parkside Sports and
Community Centre, Hoyland

P22-01115



Photograph 10: Trial pit TP102A. Trial pit arisings (2). View from south east to north west.



Met Consultancy Group Ltd
 Southgate House
 Pontefract Road
 Leeds
 LS10 1SW
 Email: admin@metconsultancygroup.com
 Phone: 0113 200 8900

Trial Pit Log

TrialPit No
 TP102B
 Sheet 1 of 1

Project Name: Parkside Sports and Community Centre, Hoyland
 Project No: P22-01115
 Co-ords: 435966572.00 - 399747919.00
 Level: 183.25
 Date: 19/12/2023

Location: Land between Sheffield Road and Stead Lane, Hoyland, Barnsley, S74 0AH
 Dimensions (m): 12.00
 Scale: 1:25

Client: Barnsley Metropolitan Borough Council
 Depth: 4.60
 Logged: YK

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.40	182.85		Grass overlying medium brown silty sandy slightly gravelly CLAY with frequent rootlets. Sand is fine. Gravel is angular fine to coarse of mixed lithologies including sandstone, mudstone, coal, limestone, and chalk. Assessed as soft as finger easily pushed in by up to 10mm. (TOPSOIL)
				1.50	181.75		Orangish medium brown and grey SAND and GRAVEL with pockets of clay and a moderate cobble content. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of mudstone siltstone and coal. Cobbles are angular to subangular of mudstone and siltstone up to 100mm across. (QUARRY BACKFILL in north eastern extents of trial pit, beyond the identified high wall)
	3.00 - 4.60	B					Grey SAND and GARVEL with pockets of clay with a very high cobble and boulder content. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of mudstone. Cobbles and boulders are very angular of mudstone and siltstone up to 500mm across. Occasional whole bricks noted. (QUARRY BACKFILL in north eastern extents of trial pit, beyond the identified high wall)
				4.60	178.65		End of Pit at 4.60m

Remarks: Trial pit undertaken as extension of TP102A, with the aim of identifying the high wall of opencast quarry.

Stability: Stable Weather: Overcast

Trial Pit Photos

TP102B

Parkside Sports and
Community Centre, Hoyland

P22-01115



Photograph 11: Trial pit TP102B. View of trial pit while excavation is ongoing. View of trial pit from south west to north east.



Photograph 12: Trial pit TP102B. View of trial pit from north east to south west.

Trial Pit Photos

TP102B

Parkside Sports and
Community Centre, Hoyland

P22-01115



Photograph 13: Trial pit TP102B. High wall of opencast mine workings identified in the central pit area. View from north east to south west.



Photograph 14: Trial pit TP102B. Trial pit topsoil arisings (1). View from north east to south west.

Trial Pit Photos

TP102B

Parkside Sports and
Community Centre, Hoyland

P22-01115



Photograph 15: Trial pit TP102B. Trial pit arisings (2). View from east to west.



Photograph 16: Trial pit TP102B. Trial pit arisings (3). View from east to west.



Met Consultancy Group Ltd
 Southgate House
 Pontefract Road
 Leeds
 LS10 1SW
 Email: admin@metconsultancygroup.com
 Phone: 0113 200 8900

Trial Pit Log

TrialPit No
 TP103
 Sheet 1 of 1

Project Name: Parkside Sports and Community Centre, Hoyland
 Project No: P22-01115
 Co-ords: 436008314.00 - 399725220.00
 Level: 181.33
 Date: 19/12/2023

Location: Land between Sheffield Road and Stead Lane, Hoyland, Barnsley, S74 0AH
 Dimensions (m): 6.20
 Scale: 1:25

Client: Barnsley Metropolitan Borough Council
 Depth: 4.10
 Logged: YK

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.30			181.02		MADE GROUND: Grass overlying medium brown silty SAND and GRAVEL with pockets of stiff clay and frequent rootlets. Sand is fine to coarse. Gravel is angular fine to coarse of mixed lithologies including sandstone, mudstone, brick and coal. Organic odour noted. Wood fragments noted. (TOPSOIL)	
	1.00 - 1.50	B				Grey brown mottled orange SAND and GRAVEL with pockets of stiff clay and a moderate cobble and boulder content. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of mixed lithologies including siltstone, mudstone, coal and brick. Cobbles and boulders are angular to subangular of siltstone and mudstone up to 300mm across. (QUARRY BACKFILL)	1
	2.20		HVR=65 HVR=70	2.00	179.32	Medium brown mottled orange silty sandy gravelly CLAY with a moderate cobble and boulder content. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of mixed lithologies including siltstone, mudstone, coal and brick. Cobbles and boulders are angular to subangular of siltstone and mudstone up to 350mm across. Relic rootlets noted throughout. Assessed as stiff as can be indented slightly by thumb. (QUARRY BACKFILL)	2
	3.00 - 3.50	B					3
				3.70	177.62	Grey silty SAND and GRAVEL with pockets of stiff clay and a high cobble and boulder content. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of mudstone/siltstone up to 700mm across. (QUARRY BACKFILL)	4
				4.10	177.22	End of Pit at 4.10m	5

Remarks: Terminated on boulder obstructions within quarry backfill.

Stability: Stable Weather: Overcast

Trial Pit Photos

TP103

Parkside Sports and
Community Centre, Hoyland

P22-01115



Photograph 17: Trial pit TP103. View of trial pit from east to west.



Photograph 18: Trial pit TP103. Northern side, western side, and base of trial pit. View from south east to north west.

Trial Pit Photos

TP103

Parkside Sports and
Community Centre, Hoyland

P22-01115



Photograph 19: Trial pit TP103. Base of trial pit. View from east to west.



Photograph 20: Trial pit TP103. Trial pit arisings (1). View from south east to north west.

Trial Pit Photos

TP103

Parkside Sports and
Community Centre, Hoyland

P22-01115



Photograph 21: Trial pit TP103. Trial pit arisings (2). View from east to west.



Photograph 22: Trial pit TP103. Trial pit arisings (3). View from south west to north east.

Appendix V

Summary of Plate Load CBR Ground Conditions

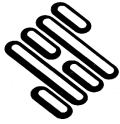


CBR Test Ref.	Depth of Test (mbgl)	CBR Value (%)	Trial Pit Dimensions (m)	Stratum Description
CBR01	0.50	94	1.7 x 3.0 x 0.5	<p>0.00-0.45mbgl - MADE GROUND: Grass overlying medium brown silty sandy gravelly CLAY. Sand is fine. Gravel is angular to subangular fine to coarse of sandstone, mudstone, brick, and coal. Frequent rootlets noted. Assessed as soft as finger pushed in by up 10mm. (TOPSOIL)</p> <p>0.45-0.50mbgl – REWORKED GROUND: Brown / mottled orange silty slightly sandy gravelly CLAY. Sand is fine to medium. Gravel is angular to subangular fine to coarse of sandstone, mudstone, and coal. Fine relic rootlets noted. Assessed as firm to stiff and friable.</p> <p>Plastic sheet noted in south west of pit.</p>
CBR02	0.50	8.0	1.6 x 3.1 x 0.5	<p>0.00-0.45mbgl - MADE GROUND: Grass overlying medium brown silty sandy gravelly CLAY. Sand is fine. Gravel is angular to subangular fine to coarse of sandstone, mudstone, brick, and coal. Frequent rootlets noted. Assessed as soft as finger pushed in by up 10mm. (TOPSOIL)</p> <p>0.45-0.50mbgl - REWORKED GROUND: Brown / mottled orange silty slightly sandy gravelly CLAY. Sand is fine to medium. Gravel is angular to subangular fine to coarse of sandstone, mudstone, and coal. Fine relic rootlets noted. Assessed as firm to stiff and friable.</p>
CBR03	0.50	9.8	1.5 x 3.0 x 0.5	<p>0.00-0.45mbgl - MADE GROUND: Grass overlying medium brown silty sandy gravelly CLAY (TOPSOIL). Sand is fine. Gravel is angular to subangular fine to coarse of sandstone, mudstone, brick, and coal. Frequent rootlets noted. Assessed as soft as finger pushed in by up 10mm.</p> <p>0.45-0.50mbgl - REWORKED GROUND: Brown / mottled orange silty slightly sandy gravelly CLAY. Sand is fine to medium. Gravel is angular to subangular fine to coarse of sandstone, mudstone, and coal. Fine relic rootlets noted. Assessed as firm to stiff and friable.</p>
CBR04	0.40	3.4	1.4 x 2.9 x 0.45	<p>0.00-0.35mbgl - MADE GROUND: Grass overlying medium brown silty sandy gravelly CLAY. Sand is fine. Gravel is angular to subangular fine to coarse of sandstone, mudstone, and coal. Frequent rootlets noted. Assessed as soft as finger pushed in by up 10mm. (TOPSOIL)</p> <p>0.35-0.40mbgl - REWORKED GROUND: Brown / mottled orange silty slightly sandy gravelly CLAY. Sand is fine to medium. Gravel is angular to subangular fine to coarse of sandstone, mudstone, and coal. Fine relic rootlets noted. Assessed as firm to stiff and friable.</p>

Appendix VI

Plate Load CBR Testing Results





STRUCTURAL SOILS LTD
INSITU TESTING REPORT



1774

Report No. 785529R.01(00)

Date	19-December-2023	Contract	Parkside Sports & Community Centre
Client	Met Engineers Ltd		
Address	Southgate House Pontefract Road Leeds LS10 1SW		

For the Attention of Yasemin Kolsuz

Order received	30-November-2023	Client Reference	P23-01115
Testing Started	18-December-2023	Client Order No.	PO-08793
Testing Completed	18-December-2023	Instruction Type	Written

Tests marked 'Not UKAS Accredited' in this report are not included in the UKAS Accreditation Schedule for our Laboratory.

UKAS Accredited Tests

* 4 no. Plate Load Test in accordance with BS1377:Part 9:1990, Clause 4.1

Not UKAS Accredited Tests

The results represent the ground conditions at the specified locations and depths at the time of testing.

Please Note: Remaining samples will be retained for a period of one month from today and will then be disposed of .
Test were undertaken on samples 'as received' unless otherwise stated.
Opinions and interpretations expressed in this report are outside the scope of accreditation for this laboratory.
Results relate only to items tested
This report shall not be reproduced except in full without written permission of SSL Laboratories

Structural Soils Ltd, The Potteries, Pottery Street, Castleford, WF10 1NJ Tel.01977552255. e-mail matthew.doran@soils.co.uk

TESTING VERIFICATION CERTIFICATE



1774

The test results included in this report are certified as:-

ISSUE STATUS: **FINAL**

In accordance with the Structural Soils Ltd Laboratory Quality Management System, results sheets and summaries of results issued by the laboratory are checked by an approved signatory. The integrity of the test data and results are ensured by control of the computer system employed by the laboratory as part of the Software Verification Program as detailed in the Laboratory Quality Manual.

This testing verification certificate covers all testing compiled on or before the following datetime: **19/12/2023 09:24:43**.

Testing reported after this date is not covered by this Verification Certificate.

Approved Signatory
Matthew Doran (Site Testing Manager (North))

(Head Office)
Bristol Laboratory
Unit 1A, Princess Street
Bedminster
Bristol
BS3 4AG

Castleford Laboratory
The Potteries, Pottery Street
Castleford
West Yorkshire
WF10 1NJ

Hemel Laboratory
18 Frogmore Road
Hemel Hempstead
Hertfordshire
HP3 9RT

Tonbridge Laboratory
Anerley Court, Half Moon Lane
Hildenborough
Tonbridge
TN11 9HU



**STRUCTURAL
SOILS LTD**

Contract:

**Parkside Sports & Community
Centre**

Job No:

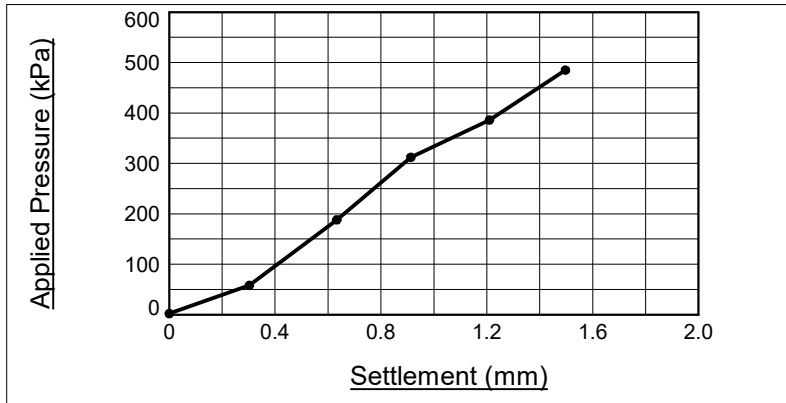
785529



PLATE LOADING TEST - INCREMENTAL

BS1377:Part 9:1990, Clause 4.1

Position ID: **PBCBR01** Depth (m) : **0.50** Date of Test : **18/12/23**



Applied Pressure (kPa)	Average Settlement (mm)
2	0.000
58	0.303
188	0.633
312	0.913
386	1.210
485	1.497

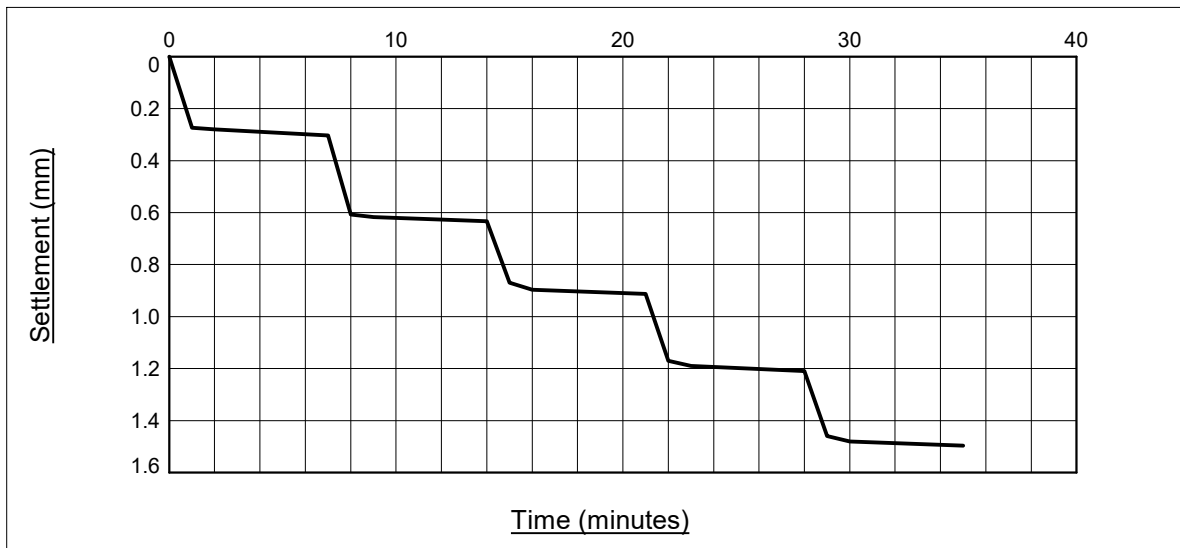


Plate Diameter (mm):	455	Reaction Load :	13T
Maximum Applied Pressure (kPa):	485	Maximum Applied Deformation (mm) :	1.497

Modulus of Subgrade Reaction at 1.25mm			
Applied Pressure:	400 kPa	Conversion to k_{762} :	$k_{455} \times 0.6273$
k_{455} :	320000 kN/m ² /m	k_{762} :	200736 kN/m ² /m
Approximate Equivalent CBR Value (%): 94			
Calculations derived from section 7.14 of Department of Transport, Interim Advice Note 73/06 (Draft HD25) February 2009 Design Guidance for Road Pavement Foundations			

Additional Information
Environmental Conditions at Time of Test: Overcast
Start Temperature: 12°C
End Temperature: 12°C

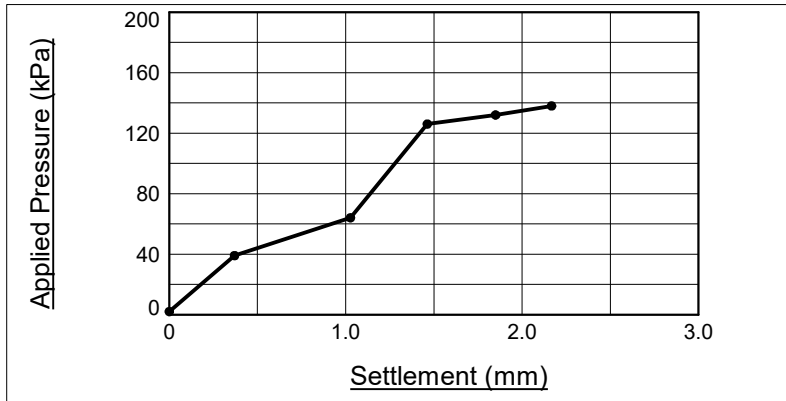
GINT_LIBRARY_V10_01.GLB LibVersion: v8_07 | Graph | - PLATE LOADING [R1] - A4P | 785529.GINT.GPJ - v10_01. Structural Soils Ltd. Branch Office - Bristol Lab: 1a Princess Street, Bedminster, Bristol, BS3 4AG. Tel: 0117-947-1000. Fax: 0117-947-1004. Web: www.soils.co.uk. Email: ask@soils.co.uk. | 19/12/23 - 09:29 | KL2 |

 <p>STRUCTURAL SOILS 1a Princess Street Bedminster Bristol BS3 4AG</p>	Compiled By		Date
	<i>K Limacher</i>		KATIE LIMACHER
	Contract		Contract Ref:
Parkside Sports & Community Centre		785529	

PLATE LOADING TEST - INCREMENTAL

BS1377:Part 9:1990, Clause 4.1

Position ID: **PBCBR02** Depth (m) : **0.50** Date of Test : **18/12/23**



Applied Pressure (kPa)	Average Settlement (mm)
2	0.000
39	0.370
64	1.027
126	1.463
132	1.850
138	2.167

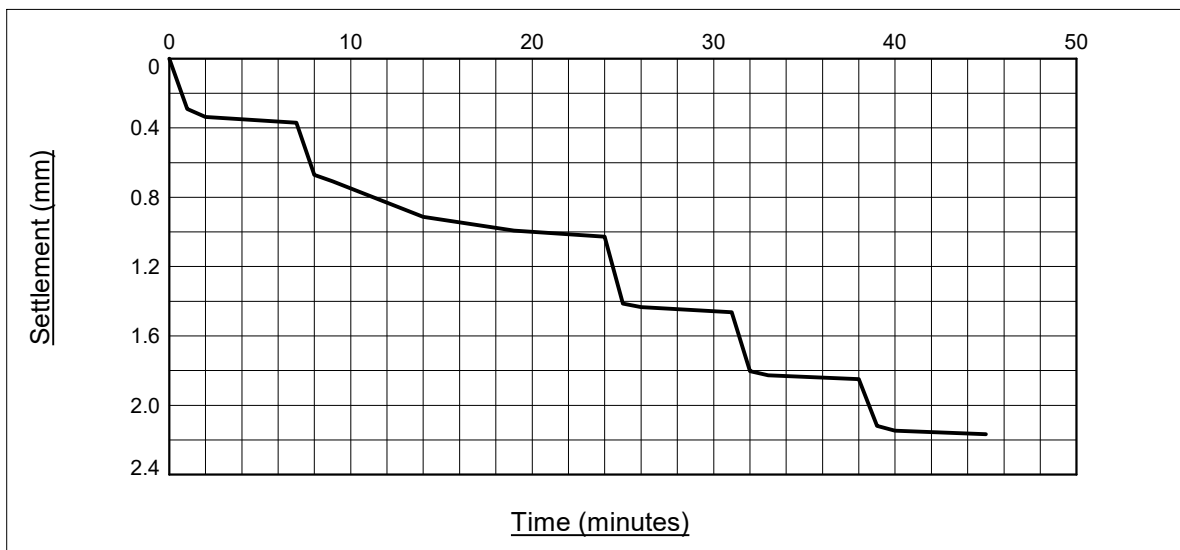


Plate Diameter (mm):	455	Reaction Load :	13T
Maximum Applied Pressure (kPa):	138	Maximum Applied Deformation (mm) :	2.167

Modulus of Subgrade Reaction at 1.25mm			
Applied Pressure:	96 kPa	Conversion to k_{762} :	$k_{455} \times 0.6273$
k_{455} :	76800 kN/m ² /m	k_{762} :	48177 kN/m ² /m
Approximate Equivalent CBR Value (%): 8.0			
Calculations derived from section 7.14 of Department of Transport, Interim Advice Note 73/06 (Draft HD25) February 2009 Design Guidance for Road Pavement Foundations			

Additional Information
Environmental Conditions at Time of Test: Overcast
Start Temperature: 12°C
End Temperature: 12°C

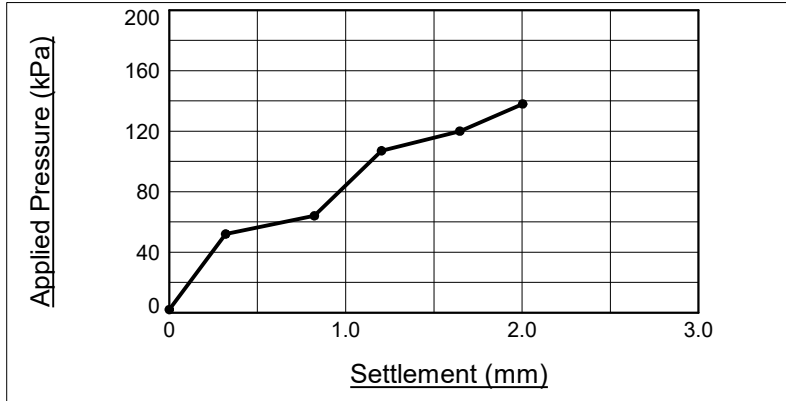
GINT_LIBRARY_V10_01.GLB LibVersion: v8_07 | Graph | - PLATE LOADING [R1] - A4P | 785529.GINT.GPJ - v10_01. Structural Soils Ltd, Branch Office - Bristol Lab: 1a Princess Street, Bedminster, Bristol, BS3 4AG. Tel: 0117-947-1000. Fax: 0117-947-1004. Web: www.soils.co.uk. Email: ask@soils.co.uk. | 19/12/23 - 09:29 | KL2 |

 <p>STRUCTURAL SOILS 1a Princess Street Bedminster Bristol BS3 4AG</p>	Compiled By		Date
	<i>KLimacher</i>		KATIE LIMACHER
	Contract		Contract Ref:
Parkside Sports & Community Centre		785529	

PLATE LOADING TEST - INCREMENTAL

BS1377:Part 9:1990, Clause 4.1

Position ID: **PBCBR03** Depth (m) : **0.50** Date of Test : **18/12/23**



Applied Pressure (kPa)	Average Settlement (mm)
2	0.000
52	0.320
64	0.823
107	1.203
120	1.647
138	2.003

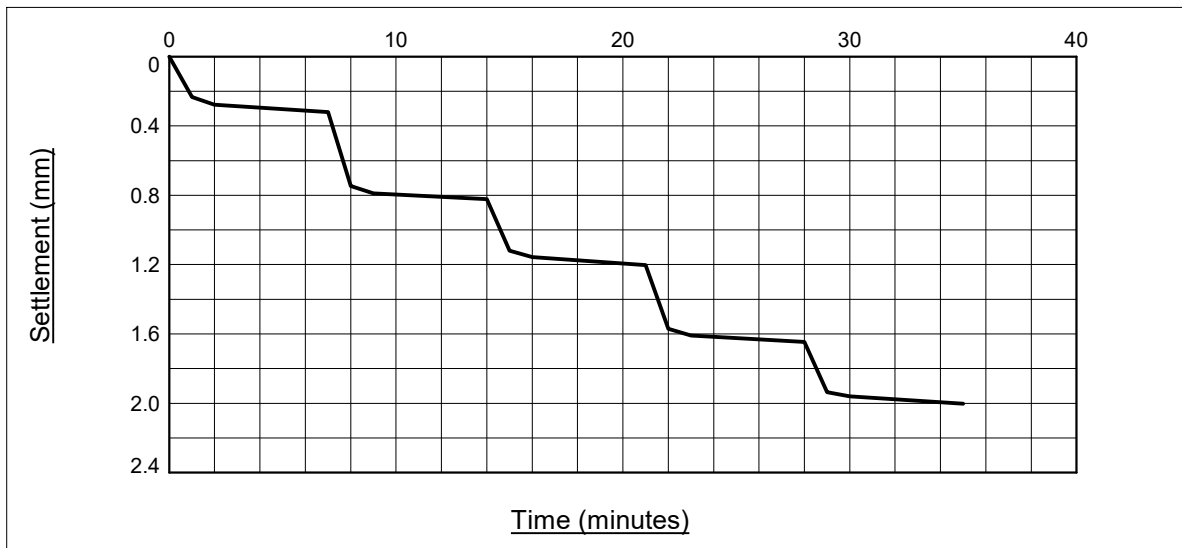


Plate Diameter (mm):	455	Reaction Load :	13T
Maximum Applied Pressure (kPa):	138	Maximum Applied Deformation (mm) :	2.003

Modulus of Subgrade Reaction at 1.25mm			
Applied Pressure:	108	kPa	Conversion to k_{762} :
k_{455} :	86400	kN/m ² /m	$k_{455} \times 0.6273$
			54199 kN/m ² /m
Approximate Equivalent CBR Value (%): 9.8			
Calculations derived from section 7.14 of Department of Transport, Interim Advice Note 73/06 (Draft HD25) February 2009 Design Guidance for Road Pavement Foundations			

Additional Information
Environmental Conditions at Time of Test: Overcast
Start Temperature: 12°C
End Temperature: 12°C

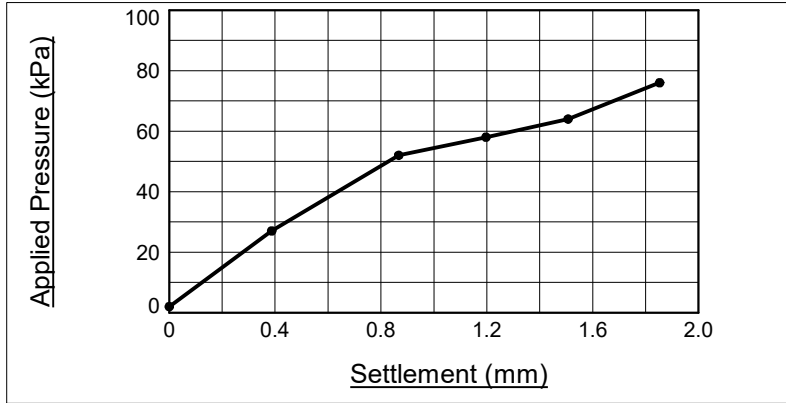
GINT_LIBRARY_V10_01.GLB LibVersion: v8_07 | Graph | - PLATE LOADING [R1] - A4P | 785529.GINT.GPJ - v10_01. Structural Soils Ltd, Branch Office - Bristol Lab: 1a Princess Street, Bedminster, Bristol, BS3 4AG. Tel: 0117-947-1000. Fax: 0117-947-1004. Web: www.soils.co.uk. Email: ask@soils.co.uk. | 19/12/23 - 09:29 | KL2 |

 <p>STRUCTURAL SOILS 1a Princess Street Bedminster Bristol BS3 4AG</p>	Compiled By		Date
	<i>K. Limacher</i>		19/12/23
	Contract	Contract Ref:	
	Parkside Sports & Community Centre	785529	

PLATE LOADING TEST - INCREMENTAL

BS1377:Part 9:1990, Clause 4.1

Position ID: **PBCBR04** Depth (m) : **0.40** Date of Test : **18/12/23**



Applied Pressure (kPa)	Average Settlement (mm)
2	0.000
27	0.387
52	0.867
58	1.197
64	1.507
76	1.853

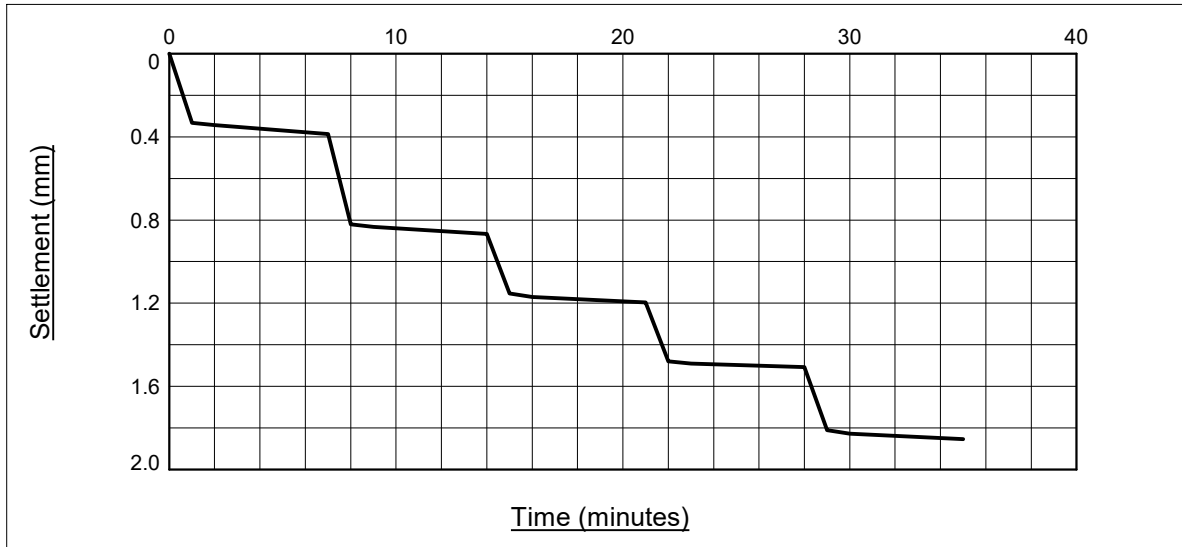


Plate Diameter (mm):	455	Reaction Load :	13T
Maximum Applied Pressure (kPa):	76	Maximum Applied Deformation (mm) :	1.853

Modulus of Subgrade Reaction at 1.25mm			
Applied Pressure:	59 kPa	Conversion to k_{762} :	$k_{455} \times 0.6273$
k_{455} :	47200 kN/m ² /m	k_{762} :	29609 kN/m ² /m
Approximate Equivalent CBR Value (%): 3.4			
Calculations derived from section 7.14 of Department of Transport, Interim Advice Note 73/06 (Draft HD25) February 2009 Design Guidance for Road Pavement Foundations			

Additional Information
Environmental Conditions at Time of Test: Overcast
Start Temperature: 12°C
End Temperature: 12°C

GINT_LIBRARY_V10_01.GLB LibVersion: v8_07 | Graph | - PLATE LOADING [R1] - A4P | 785529.GINT.GPJ - v10_01. Structural Soils Ltd, Branch Office - Bristol Lab: 1a Princess Street, Bedminster, Bristol, BS3 4AG. Tel: 0117-947-1000. Fax: 0117-947-1004. Web: www.soils.co.uk. Email: ask@soils.co.uk. | 19/12/23 - 09:29 | KL2 |

 <p>STRUCTURAL SOILS 1a Princess Street Bedminster Bristol BS3 4AG</p>	Compiled By		Date
	<i>KLimacher</i>		19/12/23
	Contract	Contract Ref:	
Parkside Sports & Community Centre		785529	

Appendix VII

Laboratory Testing Results



FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 24/00169
Issue Number: 1
Date: 24 January, 2024

Client: MET Engineers Ltd
Southgate House
Pontefract Road
Leeds
LS10 1SW

Project Manager: Olivia Francis/Thomas White/Yasemin Kolsuz
Project Name: Parkside Sports and Community Centre
Project Ref: P22-01115
Order No: PO-08912
Date Samples Received: 20/12/23
Date Instructions Received: 09/01/24
Date Analysis Completed: 24/01/24

Approved by:



Richard Wong
Client Manager

Envirolab Job Number: 24/00169

Client Project Name: Parkside Sports and Community Centre

Client Project Ref: P22-01115

Lab Sample ID	24/00169/2	24/00169/4	24/00169/12	24/00169/14	24/00169/17	24/00169/18	24/00169/23	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	RO-01	RO-02	RO-03	RO-03	RC-01	RC-01	RC-01			
Depth to Top	1.60	2.20	2.85	5.80	0.90	0.50	3.90			
Depth To Bottom	2.00	3.00	3.50	6.50	2.40	0.90	4.30			
Date Sampled	18-Dec-23	14-Dec-23	15-Dec-23	15-Dec-23	19-Dec-23	19-Dec-23	19-Dec-24			
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL			
Sample Matrix Code	6AE	6A	6A	6A	6A	6AE				
% Stones >10mm _A	5.6	22.5	<0.1	19.7	<0.1	<0.1	-			
pH _D ^{M#}	8.17	8.21	8.48	8.35	5.06	6.74	-	pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.02	0.02	0.03	0.07	0.07	0.05	-	g/l	0.01	A-T-026s
Sulphate (acid soluble) _D ^{M#}	<200	<200	260	220	300	230	-	mg/kg	200	A-T-028s
(1.01) Item 1a Moisture Content of Soil (Oven Dried Method) _A [#]	Appended	-	-	Appended	Appended	Appended	Appended			Subcon IFA
(1.02) Item 2.4 4 Point Liquid & Plastic Limit by Cone Penetrometer _A [#]	-	-	-	Appended	-	-	Appended			Subcon IFA

Envirolab Job Number: 24/00169

Client Project Name: Parkside Sports and Community Centre

Client Project Ref: P22-01115

Lab Sample ID	24/00169/2	24/00169/4	24/00169/12	24/00169/14	24/00169/17	24/00169/18	24/00169/23	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	RO-01	RO-02	RO-03	RO-03	RC-01	RC-01	RC-01			
Depth to Top	1.60	2.20	2.85	5.80	0.90	0.50	3.90			
Depth To Bottom	2.00	3.00	3.50	6.50	2.40	0.90	4.30			
Date Sampled	18-Dec-23	14-Dec-23	15-Dec-23	15-Dec-23	19-Dec-23	19-Dec-23	19-Dec-24			
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL			
Sample Matrix Code	6AE	6A	6A	6A	6A	6AE				
Asbestos in Soil (inc. matrix)										
Asbestos in soil [†]	-	-	-	-	-	NAD	-			A-T-045
Asbestos Matrix (visual) _D	-	-	-	-	-	-	-			A-T-045
Asbestos Matrix (microscope) _D	-	-	-	-	-	-	-			A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	-	-	-	-	-	N/A	-			A-T-045

Envirolab Job Number: 24/00169

Client Project Name: Parkside Sports and Community Centre

Client Project Ref: P22-01115

Lab Sample ID	24/00169/24	24/00169/25	24/00169/26					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	RC-01	RC-01	RC-01							
Depth to Top	6.45	8.70	13.80							
Depth To Bottom	6.60	8.90	14.20							
Date Sampled	19-Dec-24	19-Dec-24	19-Dec-24							
Sample Type	SOLID	SOLID	SOLID							
Sample Matrix Code	7	7	7							
% Stones >10mm _A	<0.1	<0.1	<0.1					% w/w	0.1	A-T-044
pH _D ^{M#}	8.08 ^U	8.27 ^U	8.58 ^U					pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.03 ^U	0.01 ^U	0.01 ^U					g/l	0.01	A-T-026s
Sulphate (acid soluble) _D ^{M#}	<200 ^U	<200 ^U	<200 ^U					mg/kg	200	A-T-028s

Report Notes

General

This report shall not be reproduced, except in full, without written approval from Envirolab.
 The results reported herein relate only to the material supplied to the laboratory.
 The residue of any samples contained within this report, and any received within the same delivery, will be disposed of **four weeks** after the initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of **six months** after the initial Asbestos testing is completed.
 Analytical results reflect the quality of the sample at the time of analysis only.
 Opinions and Interpretations expressed are outside our scope of accreditation.
 The client Sample No, Client Sample ID, Depth to top, Depth to Bottom and Date Sampled are all provided by the client.
 A deviating sample report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

Key

Superscript "#"	Accredited to ISO 17025
Superscript "M"	Accredited to MCertS
Superscript "U"	Individual result not accredited
None of the above symbols	Analysis unaccredited
Subscript "A"	Analysis performed on as-received Sample
Subscript "D"	Analysis performed on the dried sample, crushed to pass 2mm sieve.
Subscript "A"	Analysis has dependant options against results. Details appear in the comments of your Sample receipt
IS	Insufficient Sample for analysis
US	Unsuitable Sample for analysis
NDP	No Determination Possible
NAD	No Asbestos Detected
N/A	Not applicable

Asbestos

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
 Stones etc. are not removed from the sample prior to analysis
 Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing, and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Assigned Matrix Codes

1	SAND	6	CLAY/LOAM	A	Contains Stones
2	LOAM	7	OTHER	B	Contains Construction Rubble
3	CLAY	8	Asbestos Bulk (Only Asbestos ID accredited)	C	Contains visible hydrocarbons
4	LOAM/SAND	9	Incinerator Ash (some Metals accredited)	D	Contains glass / metal
5	SAND/CLAY			E	Contains roots / twigs

Note: 7,8,9 matrices are not covered by our ISO 17025 or MCertS accreditation, unless stated above.

Soil Chemical Analysis:

All results are reported as dry weight (<40°C).
 For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
 For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts
 All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH by method A-T-007:

For waters, free and visible oils are excluded from the sample used for analysis, so the reported result represents the dissolved phase only.
 Results "with Clean up" indicates samples cleaned up with Silica during extraction.

EPH CWG (method A-T-055) from TPH CWG:

EPH CWG results have humics mathematically subtracted through instrument calculation.
 Where these humic substances have been identified in any IDs from "TPH CWG with clean up" please note that the concentration is **NOT** included in the quantified results but present in the ID for information.

Electrical Conductivity of water by method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the accreditation range and as such are unaccredited.

Please contact your client manager if you require any further information.

Envirolab Deviating Samples Report

Hattersley Science & Technology Park, Stockport Road, Hattersley, SK14 3QU
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: MET Engineers Ltd, Southgate House, Pontefract Road, Leeds, LS10 1SW

Project No: 24/00169

Project: Parkside Sports and Community Centre

Date Received: 09/01/2024 (am)

Clients Project No: P22-01115

Cool Box Temperatures (°C): 11.4 - 13.2

NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	24/00169/2	24/00169/4	24/00169/12	24/00169/14	24/00169/17	24/00169/18	24/00169/23	24/00169/24	24/00169/25	24/00169/26
Client Sample No										
Client Sample ID/Depth	RO-01 1.60-2.00m	RO-02 2.20-3.00m	RO-03 2.85-3.50m	RO-03 5.80-6.50m	RC-01 0.90-2.40m	RC-01 0.50-0.90m	RC-01 3.90-4.30m	RC-01 6.45-6.60m	RC-01 8.70-8.90m	RC-01 13.80-14.20m
Date Sampled	18/12/23	14/12/23	15/12/23	15/12/23	19/12/23	19/12/23	19/12/24	19/12/24	19/12/24	19/12/24
A-T-026s	12/01/2024	12/01/2024	12/01/2024	12/01/2024	12/01/2024	12/01/2024		15/01/2024	15/01/2024	15/01/2024
A-T-028s	11/01/2024	11/01/2024	11/01/2024	11/01/2024	11/01/2024	11/01/2024		12/01/2024	12/01/2024	12/01/2024
A-T-031s	12/01/2024	12/01/2024	12/01/2024	12/01/2024	12/01/2024	12/01/2024		15/01/2024	15/01/2024	15/01/2024
A-T-044	11/01/2024	11/01/2024	11/01/2024	11/01/2024	11/01/2024	11/01/2024		15/01/2024	15/01/2024	15/01/2024
A-T-045						10/01/2024				

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

Envirolab
 Housesteads,
 Off Stockport Road,
 Hattersley,
 SK14 3QU


F.A.O.

Final Test Report - 2281844 / 1

Site: P22-01115
 Job Number: 2281844
 Originating Client: Envirolab
 Originating Reference: 24/00169
 Date Sampled: Not Given
 Date Scheduled: 12/01/2024
 Date Testing Started: 15/01/2024
 Date Testing Finished: 18/01/2024

Previous Reports	Amendments	Date Issued

Amendments:

Authorised By: 
 Tim Robinson
 Quality Supervisor

Report Issue Date: 19/01/2024

Site: P22-01115

Job Number: 2281844

Client: Envirolab

Page: 2

**Determination of Moisture Content, Liquid Limit and Plastic Limit
and Derivation of Plasticity and Liquidity Index**

Borehole / Trial Pit	Depth (m)	Sample	Natural Moisture Content %	Natural - Stones removed by hand Sieved - Washed on 425 µm sieve			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	Description / Remarks
				Natural / Sieved	Percentage Passing %	Moisture Content %						
RC-01	3.90	B	13	Sieved	48	22	44	25	19	-0.17	CI	Brown sandy, very silty CLAY

Method of Preparation: BS 1377 : Part 1 : 1990 : Clause 7 Preparation of disturbed samples for testing
 BS 1377 : Part 1 : 2016 : Clause 8.4.3 Preparation of samples for plasticity tests
 BS 1377 : Part 2 : 1990 : Clause 4.2 Preparation of samples for plastic limit tests

Method of Test: BS 1377 : Part 2 : 1990 : Clause 3.2 Determination of moisture content
 BS 1377 : Part 2 : 1990 : Clause 4.3 or 4.4 Determination of the liquid limit
 BS 1377 : Part 2 : 1990 : Clause 5.3 Determination of the plastic limit and plasticity index



1464

Results reported relate only to the samples tested.



Final Test Report - 2281844 / 1

Site: P22-01115

Job Number: 2281844

Originating Client: Envirolab

All opinions and interpretations contained within this report are outside of our Scope of Accreditation.

This test report shall not be reproduced, except in full and only with the written permission of Ian Farmer Associates Ltd.

Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report End

Report Issue Date: 17/01/2024

Envirolab
 Housesteads,
 Off Stockport Road,
 Hattersley,
 SK14 3QU


F.A.O.

Final Test Report - 2281843 / 1

Site: P22-01115
 Job Number: 2281843
 Originating Client: Envirolab
 Originating Reference: 24/00169
 Date Sampled: Not Given
 Date Scheduled: 12/01/2024
 Date Testing Started: 15/01/2024
 Date Testing Finished: 24/01/2024

Previous Reports	Amendments	Date Issued

Amendments:

Authorised By: 
 Tim Robinson
 Quality Supervisor

Report Issue Date: 24/01/2024

Site: P22-01115

Job Number: 2281843

Client: Envirolab

Page: 2

**Determination of Moisture Content, Liquid Limit and Plastic Limit
and Derivation of Plasticity and Liquidity Index**

Borehole / Trial Pit	Depth (m)	Sample	Natural Moisture Content %	Natural - Stones removed by hand Sieved - Washed on 425 µm sieve			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	Description / Remarks
				Natural / Sieved	Percentage Passing %	Moisture Content %						
RC-01	0.50	B	19									Brown silty CLAY
RC-01	0.90	B	15									Brown silty CLAY
RO-01	1.60	B	17									Brown silty CLAY
RO-03	5.80	B	11	Sieved	35	22	42	22	20	0.02	CI	Brown gravelly, silty CLAY

Method of Preparation: BS 1377 : Part 1 : 1990 : Clause 7 Preparation of disturbed samples for testing
 BS 1377 : Part 1 : 2016 : Clause 8.4.3 Preparation of samples for plasticity tests
 BS 1377 : Part 2 : 1990 : Clause 4.2 Preparation of samples for plastic limit tests

Method of Test: BS 1377 : Part 2 : 1990 : Clause 3.2 Determination of moisture content
 BS 1377 : Part 2 : 1990 : Clause 4.3 or 4.4 Determination of the liquid limit
 BS 1377 : Part 2 : 1990 : Clause 5.3 Determination of the plastic limit and plasticity index



1464

Results reported relate only to the samples tested.



Final Test Report - 2281843 / 1

Site: P22-01115

Job Number: 2281843

Originating Client: Envirolab

All opinions and interpretations contained within this report are outside of our Scope of Accreditation.

This test report shall not be reproduced, except in full and only with the written permission of Ian Farmer Associates Ltd.

Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report End

Report Issue Date: 22/01/2024

Issued by	Soil Engineering Geoservices Limited, Parkside Lane, Dewsbury Road, Leeds LS11 5SX. Tel: 0113 2711111 Fax: 0113 2760472 Email: enquiries@soil-engineering.co.uk	Authorised signatory	P. A. Rodgers (Technical Manager) S. D. Harper (Laboratory Production Manager) K. A. Walker ✓ (Laboratory Manager)
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Customer name	MET Engineers Ltd
Address	MET Consultancy Group Southgate House Pontefract Road Leeds LS10 1SW
Contract name	Parkside Sports and Community Centre
Your reference	P22-01115
Dates of receipt of samples	09/01/2024
Dates of testing	22/01/2024 to 26/01/2024

Sampling was not performed by the Laboratory of Soil Engineering.

Testing was performed on 8 number of samples received in fair condition.

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

Results reported relate only to the samples tested.

Tests marked 'Not UKAS' in this report are not included in the UKAS accreditation schedule for our laboratory. These results will appear in italics on any summary of tests.

Samples will be retained for 28 days from date of issue of this report and then be disposed of, unless we receive written instruction to the contrary

Key to Laboratory Summary Sheets

Common to all summaries

Sample Type	U	Undisturbed sample	D	Small disturbed sample
	P	Piston sample	B	Bulk disturbed sample
	TW	Thin walled sample	BLK	Block sample
	L	Liner sample	C	Rock core
	AMAL	Amalgamated sample		
Test status	Any result in <i>italics</i> indicates a test that is not within the scope of the UKAS accreditation for this laboratory.			

Summary of Laboratory Soil Tests: Index / Classification Tests

Particle density	p	Small pyknometer method	g	Gas jar method
Plastic index	N/P	Non plastic, although liquid limit will have been determined if requested		
Particle size (PSD)	¹	Following value in silt column denotes combined clay and silt fraction		
	p	Following value in clay column denotes sedimentation by pipette, else sedimentation is by hydrometer.		

Summary of Laboratory Soil Tests: Strength and Permeability Tests

Triaxial	UU	Single stage unconsolidated quick undrained	UUM	Multi stage unconsolidated quick undrained
	UU3	Set of 3 unconsolidated quick undrained	CU	Single stage consolidated undrained
	CUM	Multi stage consolidated undrained	CU3	Set of 3 consolidated undrained
	CD	Single stage consolidated drained	CDM	Multi stage consolidated drained
	CD3	Set of 3 consolidated drained		
	Note that single stage tests are reported assuming $f = 0$ for total stress and $c' = 0$ for effective stress			
Consol	Oed	One-dimensional oedometer	Hyd	Hydraulic cell consolidation
	m_v	coefficient of compressibility quoted for p_0 to $p_0 + 100\text{kPa}$, where determined		
Permeability	C	Constant head permeability	T	Triaxial permeability
Shearbox	SSB	Small shear box	LSB	Large shear box
	p	Peak value	r	Residual value
	RS	Ring shear		

Summary of Laboratory Soil Re-Use Test

MCV	s	MCV value at natural or specified moisture content	int	Intercept of calibration line in MCV calibration
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Summary of Laboratory Rock Strength Tests

Point Load Type	D	Diametral	A	Axial
(Combination of)	I	Irregular lump	B	Block
	L	Test performed parallel to planes of weakness		
	P	Test performed perpendicular to planes of weakness		
	X	Invalid failure of point load (not broken between points of load application)		

Summary of Laboratory Rock Materials Tests

Ten% fines	w	Soaked test	d	Dry test
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Point Load Index Result

Point Load Type	D	Diametral	A	Axial
(Combination of)	I	Irregular lump	B	Block
	L	Parallel to planes of weakness		
	X	Invalid failure of point load (not broken between points of load application)		
Dimensions	W	Diameter of core or average smallest width perpendicular to axis of loading in a block or irregular lump		
	D	Distance between platens when just in contact with specimen		
	D'	Distance between platens at point of failure		
	De	Equivalent core diameter	Is	P/De^2
	Is(50)	$F \times Is$	F	$(De/50)^{0.45}$
	Is(50) point load strength index corrected for a diametral test of core diameter 50mm			
	For Axial/Lump tests $De^2 = (4/Pi) \times (W \times D')$		For Diametral tests $De^2 = D \times D'$	

Important note: summary sheets are provided for convenience and in no way replace individual test result sheets which shall, without exception, be regarded as the definitive result.

Project Name	Parkside Sports and Community Centre	Point Load Index Result
Project No.	LT1909	
Engineer	MET Engineers Ltd	
Client	MET Engineers Ltd	
		Test method: ISRM 1985 : Suggested Method

Hole ID	Sample depth m	Sample type	Sample no.	Specimen depth m	Specimen ref.	Description	Test Result								
							Type	W mm	D mm	D' mm	P kN	De mm	Is MIN/m2	F	Is(50) MIN/m2
RC-01	6.45	C		6.45	1	Thinly laminated grey MUDSTONE. Tested outside calibrated range of device	A+P	72.61	51.71	45.98	0.03	65.20	0.01	1.13	0.01
RC-01	6.45	C		6.45	2	Thinly laminated grey MUDSTONE. Tested outside calibrated range of device	A+P	72.86	41.58	37.6	0.05	59.06	0.01	1.08	0.02

Key
Point Load Type D Diametral A Axial
(Combination of) I Irregular lump B Block
L Parallel to planes of weakness P Perpendicular to planes of weakness
Dimensions X Invalid failure of point load (not broken between points of load application)
L Distance between contact points and nearest free end (not applicable to axial tests)
W Diameter of core or average smallest width perpendicular to axis of loading in a block or irregular lump
D Distance between platens when just in contact with specimen
D' Distance between platens at point of failure
De Equivalent core diameter Is P/De2
Is(50) F x Is F (De/50)0.45
Is(50) point load strength index corrected for a diametral test of core diameter 50mm
For Axial/Lump tests De2 = (4/Pi) x (W x D') For Diametral tests De2 = D x D'

Project Name	Parkside Sports and Community Centre	Point Load Index Result
Project No.	LT1909	
Engineer	MET Engineers Ltd	
Client	MET Engineers Ltd	
		Test method: ISRM 1985 : Suggested Method

Hole ID	Sample depth m	Sample type	Sample no.	Specimen depth m	Specimen ref.	Description	Test Result								
							Type	W mm	D mm	D' mm	P kN	De mm	Is MIN/m2	F	Is(50) MIN/m2
RC-01	7.35	C		7.35	1	Thinly laminated grey SANDSTONE.	A+P+X	70.35	63.93	61.05	4.13	73.95	0.76	1.19	0.9
RC-01	7.35	C		7.35	2	Thinly laminated grey SANDSTONE.	A+P+X	70.82	51.95	48.5	4.02	66.13	0.92	1.13	1.04

Key
Point Load Type D Diametral A Axial
(Combination of) I Irregular lump B Block
L Parallel to planes of weakness P Perpendicular to planes of weakness
Dimensions X Invalid failure of point load (not broken between points of load application)
L Distance between contact points and nearest free end (not applicable to axial tests)
W Diameter of core or average smallest width perpendicular to axis of loading in a block or irregular lump
D Distance between platens when just in contact with specimen
D' Distance between platens at point of failure
De Equivalent core diameter Is P/De2
Is(50) F x Is F (De/50)0.45
Is(50) point load strength index corrected for a diametral test of core diameter 50mm
For Axial/Lump tests De2 = (4/Pi) x (W x D') For Diametral tests De2 = D x D'

Project Name	Parkside Sports and Community Centre	Point Load Index Result
Project No.	LT1909	
Engineer	MET Engineers Ltd	
Client	MET Engineers Ltd	
		Test method: ISRM 1985 : Suggested Method

Hole ID	Sample depth m	Sample type	Sample no.	Specimen depth m	Specimen ref.	Description	Test Result								
							Type	W mm	D mm	D' mm	P kN	De mm	Is MIN/m2	F	Is(50) MIN/m2
RC-01	8.70	C		8.70	1	Thinly laminated grey MUDSTONE.	A+P+X	70.23	53.51	51.69	1.75	67.99	0.38	1.15	0.43
RC-01	8.70	C		8.70	2	Thinly laminated grey MUDSTONE.	A+P+X	70.16	39.9	34.34	2.61	55.39	0.85	1.05	0.89

Key
Point Load Type D Diametral A Axial
(Combination of) I Irregular lump B Block
L Parallel to planes of weakness P Perpendicular to planes of weakness
Dimensions X Invalid failure of point load (not broken between points of load application)
L Distance between contact points and nearest free end (not applicable to axial tests)
W Diameter of core or average smallest width perpendicular to axis of loading in a block or irregular lump
D Distance between platens when just in contact with specimen
D' Distance between platens at point of failure
De Equivalent core diameter Is P/De2
Is(50) F x Is F (De/50)0.45
Is(50) point load strength index corrected for a diametral test of core diameter 50mm
For Axial/Lump tests De2 = (4/Pi) x (W x D') For Diametral tests De2 = D x D'

Project Name	Parkside Sports and Community Centre	Point Load Index Result
Project No.	LT1909	
Engineer	MET Engineers Ltd	
Client	MET Engineers Ltd	
		Test method: ISRM 1985 : Suggested Method

Hole ID	Sample depth m	Sample type	Sample no.	Specimen depth m	Specimen ref.	Description	Test Result								
							Type	W mm	D mm	D' mm	P kN	De mm	Is MIN/m2	F	Is(50) MIN/m2
RC-01	10.30	C		10.30	1	Thinly laminated grey MUDSTONE.	A+P	69.29	48.03	45.04	3.27	63.04	0.82	1.11	0.91
RC-01	10.30	C		10.30	2	Thinly laminated grey MUDSTONE.	A+P	69.23	38.32	34.32	2.92	55.00	0.97	1.04	1.01

Key

Point Load Type (Combination of)	D	Diametral	A	Axial
	I	Irregular lump	B	Block
	L	Parallel to planes of weakness	P	Perpendicular to planes of weakness
Dimensions	X	Invalid failure of point load (not broken between points of load application)		
	L	Distance between contact points and nearest free end (not applicable to axial tests)		
	W	Diameter of core or average smallest width perpendicular to axis of loading in a block or irregular lump		
	D	Distance between platens when just in contact with specimen		
	D'	Distance between platens at point of failure		
	De	Equivalent core diameter	Is	P/De ²
	Is(50)	F x Is	F	(De/50) ^{0.45}
	Is(50)	point load strength index corrected for a diametral test of core diameter 50mm		
		For Axial/Lump tests De ² = (4/Pi) x (W x D')		For Diametral tests De ² = D x D'

Project Name	Parkside Sports and Community Centre	Point Load Index Result
Project No.	LT1909	
Engineer	MET Engineers Ltd	
Client	MET Engineers Ltd	
		Test method: ISRM 1985 : Suggested Method

Hole ID	Sample depth m	Sample type	Sample no.	Specimen depth m	Specimen ref.	Description	Test Result								
							Type	W mm	D mm	D' mm	P kN	De mm	Is MIN/m2	F	Is(50) MIN/m2
RC-01	12.60	C		12.60	1	Thinly laminated grey MUDSTONE. Tested outside calibrated range of device	A+P	71.64	37.1	33.06	0.46	54.91	0.15	1.04	0.16
RC-01	12.60	C		12.60	2	Thinly laminated grey MUDSTONE. Tested outside calibrated range of device	A+P	72.46	31.37	28.31	0.21	51.11	0.08	1.01	0.08

Key
Point Load Type D Diametral A Axial
(Combination of) I Irregular lump B Block
L Parallel to planes of weakness P Perpendicular to planes of weakness
Dimensions X Invalid failure of point load (not broken between points of load application)
L Distance between contact points and nearest free end (not applicable to axial tests)
W Diameter of core or average smallest width perpendicular to axis of loading in a block or irregular lump
D Distance between platens when just in contact with specimen
D' Distance between platens at point of failure
De Equivalent core diameter Is P/De2
Is(50) F x Is F (De/50)0.45
Is(50) point load strength index corrected for a diametral test of core diameter 50mm
For Axial/Lump tests De2 = (4/Pi) x (W x D') For Diametral tests De2 = D x D'

Project Name	Parkside Sports and Community Centre	Point Load Index Result
Project No.	LT1909	
Engineer	MET Engineers Ltd	
Client	MET Engineers Ltd	
		Test method: ISRM 1985 : Suggested Method

Hole ID	Sample depth m	Sample type	Sample no.	Specimen depth m	Specimen ref.	Description	Test Result								
							Type	W mm	D mm	D' mm	P kN	De mm	Is MIN/m2	F	Is(50) MIN/m2
RC-01	14.80	C		14.80	1	Thinly inter-laminated grey MUDSTONE and SANDSTONE.	A+P+X	70.97	52.57	48.1	1.35	65.93	0.31	1.13	0.35
RC-01	14.80	C		14.80	2	Thinly inter-laminated grey MUDSTONE and SANDSTONE.	A+P+X	70.85	43.09	38.6	3.51	59.01	1.01	1.08	1.09
RC-01	14.80	C		14.80	3	Thinly inter-laminated grey MUDSTONE and SANDSTONE.	A+P+X	71.25	52.29	47.66	5.85	65.75	1.35	1.13	1.53
RC-01	14.80	C		14.80	4	Thinly inter-laminated grey MUDSTONE and SANDSTONE.	A+P+X	70.67	52.95	49.98	4.42	67.06	0.98	1.14	1.12

Key
Point Load Type D Diametral A Axial
(Combination of) I Irregular lump B Block
L Parallel to planes of weakness P Perpendicular to planes of weakness
Dimensions X Invalid failure of point load (not broken between points of load application)
L Distance between contact points and nearest free end (not applicable to axial tests)
W Diameter of core or average smallest width perpendicular to axis of loading in a block or irregular lump
D Distance between platens when just in contact with specimen
D' Distance between platens at point of failure
De Equivalent core diameter Is P/De2
Is(50) F x Is F (De/50)0.45
Is(50) point load strength index corrected for a diametral test of core diameter 50mm
For Axial/Lump tests De2 = (4/Pi) x (W x D') For Diametral tests De2 = D x D'

We are Waterman, where every project matters

We deliver progressive, sustainability-driven environmental and engineering consultancy services across every sector. We think differently, and we're harnessing our collective expertise to deliver greener, healthier and well-connected communities, networks and built environments.

Based in strategic locations throughout the UK and Ireland, our team of specialists is at the forefront of tackling the climate emergency and forging a path to a Net Zero built environment.

UK & Ireland Office Locations



