SILKSTONE ENVIRONMENTAL
GEOTECHNICAL, PLANNING & SURVEYING CONSULTANTS
A PHENNA GROUP COMPANY

# LAND AT HIGHSTONE LANE, WORSBROUGH, BARNSLEY, SOUTH YORKSHIRE, S70 6SD

## PHASE 2 COAL MINING RISK ASSESSMENT

**Prepared by**

**SILKSTONE ENVIRONMENTAL LTD**

**For**

**PETER DIMBERLINE LTD**

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## REVISION RECORD

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| | | | |

## EXECUTIVE SUMMARY

The table below summarises the risk to the site from coal mining legacy issues. This Executive Summary should be read in conjunction with the entire report as it is only a brief account highlighting the key findings.

| | |
|---|---|
| **Site Location** | Highstone Lane, Worsbrough, Barnsley, South Yorkshire, S70 6SD (Figure 1). |
| **Proposed Development** | Construction of a low rise detached dwelling incorporating an access drive and parking provision with gardens/terrace to the rear (Figure 2). |
| **Objectives** | To conduct intrusive investigations (rotary boreholes and trial trenching), assess the impact of coal mining heritage issues on site and set out mitigation measures. |
| **Historic Site Use (OS Mapping)** | A previous Coal Mining Report shows the site on the earliest OS plans to have been undeveloped and grassed, with little apparent change to the present day.<br>Offsite industries included sandstone quarrying (215m N & 330m E) and coal mining (nearest Bank Top pit 350m NE). Ward Green club on SE perimeter since 1965. |
| **Site Inspection** | A grass surfaced, inverted 'L' shape, dipping to the south from 131m to 125m AOD. |
| **Geological Setting** | There is no recorded Artificial Ground or significant superficial deposits.<br>Bedrock comprises Coal Measure rocks incorporating mudstones, siltstones and sandstones with coal seams, lying stratigraphically around the Abdy coal seam, which outcrops on site.<br>Dip of strata in underlying workings is 1 in 11 to the northeast. No faulting on site. |
| **Phase 1 Coal Mining Risk Assessment (2023)** | The Phase 1 Coal Mining Risk Assessment identified the following outstanding onsite coal mining heritage issues:<br>• Presence of recorded coal mining at shallow depth in the Abdy coal seam.<br>• Presence of seven mine entries (6 adits, 1 shaft) on or within 20m of site.<br>Risk from unrecorded mine entries discounted. |
| **Phase 2 Site Investigations (2025)** | Four water flush rotary open-hole boreholes to prove presence/absence and disposition of shallow mine workings in the Abdy coal seam. Three trial pits to locate the position of four mine entries (adits) on/adjacent to the site (Figure 3). |
| **Phase 2 Site Investigation Results** | Rotary drilling proved the Abdy seam to be present beneath proposed property at a depth of 1.2m to 2.7m (to top of seam). Three boreholes proved coal and one proved old workings (Figure 4).<br>Trial pit 1 proved adit 434404-14, trial pit 2 did not prove adit 434404-13 and trial pit 3 proved adits 434404-05/16 (Figure 5). |
| **Phase 2 Interpretation of Site Investigations** | Rotary drilling proved very shallow pillar and stall mine workings.<br>Trial pit 1 proved adit 434404-14 was infilled with slightly sandy slightly gravelly clay (gravel comprising sandstone, mudstone and some wood).<br>Trial pit 3 proved adits 434404-05 and 434404-16 were infilled with slightly sandy slightly gravelly clay (gravel comprising sandstone, coal and brick).<br>SEL believe that adit 434404-13 was too deep to be proven by trial pit 2. |
| **Revised Coal Mining Risk Overview** | Coal mining legacy risks from:<br>• Recorded shallow mine workings in the Abdy coal seam;<br>• Proven mine entries 434404-14, 434404-05 and 434404-16.<br>• Recorded adit 434404-13. |
| **Potential Mitigation Measures** | *Shallow Mine Workings*: stability ratios in all boreholes are <10:1 (surface to Abdy seam). Unable to mitigate risk without further remedial work.<br>*Recorded Mine Entries*: Risk from adits 434404-05, 434404-13, 434404-14 and 434404-16 cannot be mitigated without further works. |
| **Conclusions and Recommendations** | *Recommendation to mitigate risk from shallow mine workings*:<br>Proof grouting (under a Coal Authority licence) on a 6m grid with reduced spacing where grout uptake is high. Grouting to be confined to property footprint plus 5m where feasible.<br>*Recommendation to mitigate risk from adits:*<br>Grouting of some of the adits, should mine gas monitoring prove a potential hazard.<br>If raft foundations below properties are proposed, potential risk of differential settlement affecting services and drainage on site should be considered.<br>Abdy seam outcrops on site. Outcrop coal should be removed from site where encountered to minimise risk from spontaneous combustion.<br>Gas monitoring installations in three of the boreholes. Gas monitoring (six visits over three months, on-going). Report to be prepared on completion of monitoring. |

## CONTENTS



### APPENDICES



### TABLES



### KEY REFERENCES

A Risk based approach to development management; Guidance for developers, the Coal Authority, Version 4, 2017.
B CIRIA Special Publication 32 ‘Construction over abandoned mine workings’, PR Healy & JM Head, CIRIA, 1984, reprinted 2002.
C Guidance on managing the risk of hazardous gases when drilling or piling near coal, the Coal Authority et al, v1.0, 2012
D Technical Guidance Note TGN01/2019, the Coal Authority, June 2019.
E CIRIA Report C758D Abandoned mine workings manual, CIRIA, 2019.

# 1.0 INTRODUCTION

## 1.1 Brief

Silkstone Environmental Ltd (SEL) has prepared a Phase 2 Coal Mining Risk Assessment (CMRA) for land at Highstone Lane, Worsbrough, Barnsley, South Yorkshire (the site) for Peter Dimberline Ltd following receipt of the proposal acceptance and authorisation to proceed from Mr M Hague (the client), dated 8th January 2025.

The client intends to develop the site for future residential development comprising a low rise detached dwelling. SEL have been engaged to assess the potential risk to the development from coal mining heritage issues such as shallow mine workings and mine entries (shafts/adits).

These works follow the completion of a desk based '*Coal Mining Risk Assessment'* for the site, prepared by 'Design It -Structural Solutions Ltd (DISSL)', dated September 2023, which identified potential mining risks and should be read alongside this report.

## 1.2 Objective of the Phase 2 Coal Mining Risk Assessment

The objectives of this Phase 2 CMRA report were to:

- Conduct an intrusive ground investigation under the requirements of Coal Authority[1] permit number 29438, utilising a water flush drilling medium, to a maximum depth of 30m;
- Excavate trial trenches to establish the position of recorded mine entries (adits).
- Assess the borehole information to clarify the disposition of recorded shallow mine workings below the site;
- Use this information to identify and assess the risk to the proposed development from coal mining legacy issues, including potential cumulative impact of issues;
- Set out appropriate mitigation measures to address coal mining legacy issues affecting the site, and if required, include any necessary extra site investigations or remedial works and demonstrate how coal mining issues may influence the proposed development;
- Demonstrate to the Local Planning Authority that the application site is or can be made safe and stable to meet the requirements of National Planning Policy with regard to development on unstable land.

## 1.3 Guidance and Information Sources Used Within This Report

This report has been produced in accordance with the following documents:

- '*A risk based approach to development management; Guidance for developers*' (Ref. A);
- CIRIA Special Publication No.32 '*Construction over abandoned mine workings*' (Ref. B);
- '*Guidance on managing the risk of hazardous gases when drilling or piling near coa*l' (Ref. C)
- Technical Guidance Note TGN01/2019, (Ref. D);
- '*Abandoned mine workings manua*l', CIRIA C758D, 2019 (Ref. E).

[1] In early 2025 the Coal Authority was renamed the Mining Remediation Authority.

This report has been produced in line with relevant guidance and best practice with particular regard to references A, B, C, D and E. This list is not exhaustive and comprises only the principal references used in conducting this risk assessment.

## 1.4 Report Limitations

The comments and opinions expressed in this report are based on the ground conditions encountered at the specific locations during the fieldwork. However, conditions may prevail which were not revealed by the investigation and which, therefore, could not be taken into account. In particular it should be noted that due to the unpredictable nature of old mine workings, the ability to detect their presence can vary over short distances.

The conclusions reached in this report are necessarily restricted to those which can be determined from available information and will be subject to amendment in the light of additional information becoming available or to changes in relevant legislation.

This report is strictly confidential to the party to whom it is addressed and may only be relied upon by that party or their other professional advisors, for the specific purpose to which it refers. Any third party using this report does so entirely at their own risk and SEL accepts no responsibility or liability for any costs, claims, damages or expenses (including consequential damages) as a result of this report or any part of its contents being used by any third party.

Except in connection with the specific purpose for which this report has been prepared, neither the whole nor any part of this report, nor any reference thereto, may be included in any published document, circular or statement, nor published in any way, nor disclosed orally to a third party, without the written approval from SEL of the form and context of such publication or disclosure. Such approval is required whether or not SEL are referred to by name and whether or not the report is combined with others.

SEL are unaware of any conflicts of interest in the preparation of this report.

# 2.0 ENVIRONMENTAL SETTING

## 2.1 Site Location

The site is located immediately east of Highstone Lane, Worsbrough, Barnsley, South Yorkshire, approximately 2.5km west of Barnsley town centre. The site location is identified on Figure 1 in Appendix A. The proposed boundary for the development is outlined in red on the inset map.

The National Grid Reference (NGR) for the centre of the site is 434830, 404550. It is an inverted 'L' shaped parcel of land 0.1ha in area, with a site access to the south west. The site is situated at an approximate height of 125m to 131m Above Ordnance Datum (AOD), dipping to the south.

## 2.2 Historical Site Uses

Information relating to the historical uses of the site and surrounding area has been determined from the previous CMRA undertaken by DISSL in 2023.

***On Site**:*

Earliest OS plans (1855) show the site to be open fields, with no apparent change to the present day.

***Off Site*:**

1855-1894: Sandstone quarrying 215m to the north and 330m east.

1894-1907: Bank Top and Pinder Oaks collieries located 650m and 1350m northeast respectively.

1907-1965: Sandstone quarry approximately 500m to the northwest. Old Oaks (Barnsley Main) colliery approximately 2000m to the northeast.

1965-present: Ward Green club adjacent to southeastern perimeter.
Residential properties adjacent to remaining perimeters.

## 2.3 Site Description

The site is an inverted 'L' shape in plan and currently appears to be undeveloped. An inspection of recent aerial imagery indicates the site to be entirely under rough grass cover with a mature hedge present along the southwestern boundary, an unmade track present along the northeastern perimeter with a hedgerow beyond. Both the northwestern and northeastern boundaries are fenced.

Site levels fall towards the south. The northern part of the site lies at approximately 131.0m AOD with the southern part at approximately 125.0m AOD. There is a pronounced break of slope along the southern/southeastern perimeter of the site which occupies an elevated position with respect to the adjacent highway, being enclosed by a stone retaining wall, approximately 1m high.

Existing residential properties and gardens bound the site on most perimeters with Ward Green Working Men's Club (and its associated land) present to the southeast. The club building itself is cut into the slope along its northwestern elevation. At its northern corner it is enclosed by a low brick retaining wall.

Although the site appears to be presently undeveloped, the Coal Authority records the presence of six adits (inclined mine entries) on or immediately adjacent to the site, namely, adits 434404-05, 434404-13, 434404-14, 434404-16 (on-site) and adits 434404-17 and 444304-18 (adjacent to site). A shaft (434404-19) is located near the northern perimeter of the site. These areas were reviewed, but no clear evidence of their precise location was apparent. No other indications of past mining activities were evident.

## 2.4 Proposed Development

It is proposed to construct a low rise detached residential dwelling incorporating an access drive and parking provision, with gardens and a terrace to the rear.

The finished floor level of the dwelling will be at approximately 127.0m AOD, necessitating retention of the adjacent ground by between 1 and 2m height.

The layout of the proposed development is shown edged red on Figure 2 in Appendix A.

## 2.5 Geological Setting

Information relating to the anticipated on-site geology available from the BGS website is summarised in Table 1 (next page).

**Table 1: Geological Summary (BGS Records)**

| | |
|---|---|
| **Maps / Publications Referenced** | The British Geological Survey Map of England and Wales, Sheet 87, Barnsley, Bedrock and Superficials, 1:50,000 scale (2008) and Sheet SE30SW, Solid and Drift, 1:10,000 scale (1982).<br>BGS Geoindex website.<br>The Coal Authority CON29M Mining Report No 51003373922001. |
| **Artificial Ground** | No recorded Made or Artificial Ground, but the presence of historic mining activities on site would suggest that some Made Ground may be present. |
| **Superficial Geology/Landslips** | None recorded on site. |
| **Solid Geology (Bedrock)** | Carboniferous (Duckmantian) aged strata comprising mudstones, siltstones and sandstones with coal seams of the Pennine Middle Coal Measures Formation, lying stratigraphically around the Abdy coal seam, which outcrops on site. |
| **Dip of Solid Strata** | Dip 1 in 11 to northeast (recorded in deep old workings below site) |
| **Faults** | No faulting on site. |
| **Coal Seams / Mining / Quarrying etc** | Recorded shallow (<30m) mining of the Abdy coal seam beneath site. Five deeper seams worked. Potential for unrecorded workings.<br>Coal Authority records 6 adits on/adjacent to the site.<br>One shaft adjacent to northern perimeter of the site. |

## 2.6 Phase 1 Coal Mining Risk Assessment

A previous des- based Coal Mining Risk Assessment (CMRA) for the site was prepared by DISSL in September 2023 and completed with reference to a CON29M Non-Residential Coal Mining Report No 51003373922001, dated 9th August 2023.

The potential risk from unrecorded mine entries identified by the Coal Authority can be negated when development activities commence, when it is usual practice to undertake a site scrape. Should workers observe any unexpected features in the foundation excavations such as old brickwork, voids or any unidentified or infilled structures, the advice of an appropriately qualified person should be sought.

The following outstanding onsite coal mining heritage issues were identified:

- The presence of recorded coal mining at shallow depth in the Abdy coal seam.
- The presence of seven mine entries (6 adits/1 shaft) on or within 20m of the site.

The CMRA recommended site investigations to prove the disposition of the mine workings and the precise location and method of sealing of the mine entries. The Phase 2 site investigation was undertaken by SEL in February 2025. This report details the findings from this investigation.

# 3.0 PHASE 2 COAL MINING INVESTIGATION

## 3.1 Visual Evidence of Mining Activity

There was no obvious visual evidence of former mining activity on or within the vicinity of the site from a visual inspection of surface areas.

## 3.2 Site Investigation Methodology

The site investigation was supervised by a suitably qualified SEL Engineer and involved the drilling of four rotary open-holes (BH01-4) and the excavation of three trial pits (TP01-3) across the site as shown on Figure 3 in Appendix A. Borehole logs from the investigation are presented in Appendix B. The investigation was undertaken under Mining Remediation Authority permit number 29438 dated 28th January 2025.

Methane, carbon dioxide and oxygen concentrations were continuously monitored during the investigation and concentrations within the alarm/trigger levels were not detected.

All locations were set out by SEL prior to drilling and excavation. The location of underground utilities was checked from service plans, augmented by the use on site of a Cable Avoidance Tool (CAT) prior to breaking ground at each location. Manually excavated inspection pits were dug at each borehole location prior to the commencement of drilling.

### 3.2.1 Rotary Drilling

Rotary drilling was undertaken by Ace Drilling Services between 24th and 26th February 2025 using a Baretta GT54-6 tracked drill rig utilising a water flush drilling medium. Water was contained and recycled in open metal tanks to minimise the quantity of water used and prevent uncontrolled surface water runoff.

Rotary drilling was undertaken to determine the disposition of the Abdy coal seam which is known to underly the site at shallow depth. The proposed target depth of drilling in the first borehole was 30m begl to establish the depth of the Abdy seam below the site and the potential for multiple seam workings. The remaining boreholes were drilled to 2m below the Abdy coal/old workings. The nature of the strata encountered was determined by inspection of drilling returns, penetration rates and by the presence/absence of voids/soft ground etc.

Upon completion of the drilling, three of the holes (BH02, 03 & 04) had gas monitoring apparatus installed. These comprised 1.00m of solid plastic piping extending from ground level above slotted plastic piping extending to the base of each hole and enclosed by pea gravel and sealed above by 0.80m of bentonite.

No monitoring well was established at BH01 which was backfilled with arisings with the section extending across the coal seam sealed with bentonite.

The installation of gas monitoring wells was established in the Abdy seam/old workings to allow SEL to monitor the presence/absence of mine gases in accordance with CIRIA guidance C665. Gases will be monitored for a minimum of six visits over a period of three months and a gas risk assessment report produced for the site upon completion of the monitoring.

### 3.2.2 Trial Pits

Three trial pits were excavated to confirm the presence/absence of recorded mine entries on site. Works were carried out utilising a Hitachi ZX135 14T tracked excavator. Trial pits were backfilled with the generated spoil upon completion of the works. A photographic record from the trial excavations is provided in Appendix C

## 3.3 Site Investigation Results

### 3.3.1 Rotary Drilling

The strata encountered in the rotary drilling are detailed in the rotary drilling logs presented in Appendix B, summarised below and in Figure 4, Appendix A:

| | | Thickness (m) | | | | |
|---|---|---|---|---|---|---|
| **Strata** | **Lithology** | **BH1** | **BH2** | **BH3** | **BH4** | **AVE** |
| Topsoil | | 0.3 | 0.3 | 0.3 | 0.3 | **0.3** |
| Superficial | Brown CLAY | 0.9 | 2.2 | 1.7 | 1.5 | **1.6** |
| *Depth to Rockhead (=Top of Bedrock)* | | *1.2* | *2.5* | *2.0* | *1.8* | ***1.9*** |
| Bedrock | | | | | | |
| | Mudstone (overburden) | 0.0 | 0.0 | 0.7 | 0.0 | **0.2** |
| | **ABDY SEAM #** | **1.1** | **1.0** | **0.8** | **1.0** | **1.0** |
| | CLAY/MUDSTONE | 4.2 | 2.5+ | 4.0 | 4.5 | **4.2** |
| | COAL/ dark grey MUDSTONE | 0.5 | nde | 0.5 | 0.2 | **0.4** |
| | Grey MUDSTONE with bands of siltstone | 23.0+ | nde | 2.0+ | 2.5+ | **23.0+** |
| | Base of borehole at | 30.0 | 6.0 | 10.0 | 10.0 | |

# = Recorded pillar and stall workings, black = coal pillar, red = roof coal/old workings.
nde = not deep enough.

All boreholes commenced in topsoil 0.30m thick. No Made Ground was encountered.

Superficial deposits (boulder clay) comprising a brown clay ranged in thickness from 0.90m to 2.20m (average 1.60m).

Rockhead (top of bedrock/base of superficial deposits) varied from 1.20m to 2.50m in depth.

The Abdy seam was partially outcropped in three of the boreholes, lying immediately below rockhead. The Abdy seam in BH03 was overlain by 0.70m of mudstone which underlaid the superficial deposits.

The Abdy coal seam was encountered in all four boreholes, the top of seam lying at depths ranging from 1.20m to 2.70m. Three of the boreholes encountered coal 0.80m to 1.00m thick. The fourth borehole (BH02) encountered old workings consisting of 0.30m of coal underlain by 0.70m of workings. All boreholes are located within an area of recorded old workings.

The Abdy seam floor strata comprised a clay/mudstone 4.0m to 4.5m thick, underlain by a coal/dark mudstone 0.20m to 0.50m thick and grey mudstone 2.00m+.

BH01 was drilled to a depth of 30.00m and encountered no further old workings.

### 3.3.2 Trenching/Trial Pits

Three trial pits were excavated to prove the presence/absence of recorded mine entries (adits) on site, namely:

*Trial pit 1:* to prove the location of adit 434404-14.
*Trial pit 2:* to prove the location of adit 434404-13.
*Trial pit 3:* to prove the location of adits 434404-5 and 434404-16.

Mine entries 434404-17, 434404-18 and 434404-19 were not investigated.

The strata encountered in the trial pits are summarised below and in Figure 5, Appendix A:

| Lithology | Thickness (m) |
|---|---|
| Trial Pit 1 (width 0.90m/length 7.50m, base at 1.75m depth): | |
| Slightly sandy slightly gravelly TOPSOIL. Gravel fine subangular sandstone and occasional brick fragments. | 0.30 |
| Light brown sandy gravelly CLAY. Gravel fine to coarse angular to rounded sandstone. | 0.20 |
| Light brown, slightly sandy slightly gravelly CLAY. Gravel fine to coarse, angular to rounded sandstone. | 0.70 |
| Intact COAL. | 0.55+ |
| Adit 434404-14 (approx. 1.15m thick) found backfilled with dark grey, slightly sandy, gravelly CLAY with gravel consisting of fine to coarse subangular sandstone, mudstone and large pieces of wood. | |
| Trial Pit 2 (width 0.80m/length 9.00m, base at 1.80m depth): | |
| Slightly sandy slightly gravelly TOPSOIL. Gravel fine to subangular sandstone with occasional brick fragments. | 0.30 |
| Light brown, slightly sandy slightly gravelly CLAY. Gravel fine to coarse angular to rounded sandstone. | 0.90 |
| Intact COAL. | 0.60+ |
| Adit 434404-13 not encountered. | |

Trial Pit 3 (width 0.70m/length 12.50m, base at 2.50m depth):

| | |
|---|---|
| Slightly sandy slightly gravelly TOPSOIL. Gravel was fine subangular sandstone and occasional brick fragments. | 0.30 |
| Light brown slightly sandy slightly gravelly CLAY. Gravel was fine to coarse angular to rounded sandstone. | 1.70 |
| Intact COAL. | 0.50+ |

Adit 434404-05 (1.30m thick/1.40m wide) found infilled with light grey sandy gravelly CLAY with boulders of angular sandstone. The gravel was fine to coarse subangular sandstone coal and brick.

Adit 434404-16 (1.90m thick/1.50m wide) found infilled with dark grey slightly sandy slightly gravelly CLAY with gravel consisting of fine to coarse sandstone, mudstone and brick.

## 3.4 Site Investigation Interpretation

### 3.4.1 Rotary Drilling

The Phase 1 CMRA identified the site to be in an area where old workings were recorded at shallow depths (<30m) in the Abdy coal seam.

Rotary drilling was undertaken to prove the disposition of these workings. Old workings would normally be identified in rotary drilling by the presence of a void, soft ground, a coal/thin coal (pillar), a loss of water flush, or by ochrous (iron) staining.

***On Site Disposition of the Abdy Seam (Figures 4&6, Appendix A):***

Rotary drilling proved the Abdy seam is present on site at shallow depth. Site investigations proved the depth to the top of the seam varies from 1.20m (BH1) to 2.70m (BH03) beneath the proposed development.

Mining records of deeper workings below the site indicate the Abdy seam dips to the northeast at a gradient of 1 in 11.

British Geological Survey and Coal Authority (Mining Remediation Authority) records indicate the Abdy seam outcrops on site immediately south of the proposed development.

Rotary drilling indicates the Abdy seam consists of a mixture of coal (0.80m to 1.10m thick) and old workings (1.00m thick).

SEL assess the rotary drilling results as follows:

- BH01, 03 & 04: coal (0.80m to 1.10m thick).
- BH02: old workings (1.00m thick) comprising a mixture of mudstone infill and thin (0.30m thick) roof coal.

SEL conclude that the rotary drilling undertaken on site proved the presence of recorded old mine workings in the Abdy seam. These workings took the form of a 'pillar and stall' type of extraction. 'Pillar and stall' workings consist of either infilled, collapsed debris or voids (stalls). These occur in intimate association with blocks of coal (pillars), which were originally used to support the roof whilst the seam was being extracted. Figure 6 in Appendix A shows an example of 'pillar and stall' workings.

### 3.4.2 Trenching / Trial Pits

The three trial pits encountered superficial deposits (clay) and terminated in bedrock. Two of the pits proved the top of the Abdy seam. SEL interpret the results as follows:

***Trial Pit 1 (7.50m long x 0.90m wide, base in intact coal)*:**
This was excavated to a depth of 1.75m to prove recorded adit 434404-14.

Evidence was found of the adit which was proven to a thickness of 1.15m.

The adit had been backfilled with dark grey slightly sandy gravelly CLAY. The gravel consisted of fine to coarse subangular sandstone, mudstone and large pieces of wood.

***Trial Pit 2 (9.00m long x 0.80m wide, base in intact coal)*:**
This was excavated to a depth of 1.80m to prove recorded adit 434404-13.

No evidence of the adit was encountered. SEL conclude that the adit is too deep on site to be proven by trial pitting.

***Trial Pit 3 (12.50m long x 0.70m wide, base in intact coal)*:**
This was excavated to a depth of 2.50m to prove recorded adits 434404-05 and 434404-16.

Evidence was found of adit 434404-16, which was proven to a thickness of 1.90m and 1.50m width. The adit was backfilled with dark grey slightly sandy gravelly CLAY. The gravel consisted of fine to coarse subangular sandstone, mudstone and brick.

Evidence was also found of adit 434404-05 which was proven to a thickness of 1.30m and 1.40m width. The adit was backfilled with light grey sandy gravelly CLAY with boulders of angular sandstone. The gravel consisted of fine to coarse subangular sandstone, coal and brick.

## 4.0 REVISED COAL MINING RISK ASSESSMENT

The table below summarises potential risks associated with coal mining legacy for the proposed site, identified from the sources of information in the Coal Mining Report (CMR), augmented by abandoned mine plans and site investigations undertaken in December 2023.

### Table 2. Summary of Potential Risks Associated with Coal Mining

| Coal Mining Issue | Coal Mining Risk | | Risk Assessment |
|---|---|---|---|
| | Yes | No | |
| Past recorded underground coal mining at depth (>30) | | ✓ | |
| Past shallow recorded underground coal mining (<30m depth) | ✓ | | 'Pillar and stall type' old workings in the Abdy seam proven by rotary drilling at a depth of 1.20m to 2.70m (top of seam) below the proposed property. |
| Past shallow unrecorded underground coal mining (<40m depth) | | ✓ | |
| Present underground coal mining | | ✓ | |
| Future underground coal mining | | ✓ | |
| Recorded mine entries (shafts/adits) | ✓ | | Adits 434404-14, 434404-05 and 434404-16 proven and potentially present a risk to the development.<br>Adit 434404-13 not proven (trial pit not deep enough) but could still present a risk to development. |
| Unrecorded mine entries (shafts/adits) | | ✓ | Identified as a potential hazard based on past occurrences in the area (low risk). |
| Coal mining geology (fissures) | | ✓ | |
| Past opencast (surface) coal mining | | ✓ | |
| Present/future opencast coal mining | | ✓ | |
| Coal mining subsidence | | ✓ | |
| Record of past mine gas emissions | | ✓ | |
| Recorded surface hazards related to coal mining | | ✓ | |
| Withdrawal of Support | | ✓ | |
| Working Facilities Order | | ✓ | |

The 2025 rotary drilling, augmented by the Coal Mining Report identified the following coal mining legacy risks which cannot be mitigated without further works:

- Risk from recorded shallow mine workings (<30m) in the Abdy coal seam.
- Risk from recorded mine entries (adits 434404-14, 434404-05, 434404-16 and 434404-13).

## 5.0 POTENTIAL MITIGATION MEASURES

The Coal Authority (Mining Remediation Authority), as a Statutory Consultee in the planning process, has the right to object to surface developments it considers may be at risk from coal mining legacy issues. The burden of discounting risk is placed on the developer. However, mining legacy risk can be mitigated if it can be proven an issue is unlikely to impact on surface stability. This section describes such issues and concludes whether they can be mitigated or not.

### 5.1 Mitigation Measures for Old Workings

The 2025 rotary drilling programme proved the presence of past mine workings in the Abdy seam at shallow depths (<30m). The stability of surface development in areas of past coal mining is dependent on bed separation in roof strata and void migration from old workings towards the surface. The normally accepted safe overburden (excluding unconsolidated deposits) to extraction ratio typically adopted within the industry is 10:1. Should the ratio be less than 10:1, then a mitigation strategy would be required to address the potential for instability. If the ratio is greater than 10:1 then the risk is mitigated.

***Stability Ratios from Surface to Abdy Seam:***

Site investigations proved the following extraction ratios to the Abdy seam:

| Borehole Number | Depth Top of Abdy Seam | Unconsol Thickness[$] | Overburden Thickness[#] | Extraction Thickness[£] | Stability Ratio |
|---|---|---|---|---|---|
| BH01 | 1.20m | 1.20m | 0.00m | 1.00m | 0 |
| BH02 | 2.50m | 2.50m | 0.00m | 1.00m | 0 |
| BH03 | 2.70m | 2.00m | 0.70m | 1.00m | 0.40-1.00 |
| BH04 | 1.80m | 1.80m | 0.00m | 1.00m | 0 |

$ unconsolidated = superficial deposits and made ground/fill etc.
# overburden is the thickness excluding superficial and artificial deposits.
£ Extraction thickness taken from workings in borehole 2.

Stability ratios between the surface and the Abdy seam proved to be substantially less than 10:1.

***Other Factors:***

The Coal Authority Technical Guidance Note TGN01/2019 (Ref. D) and CIRIA Report C758D '*Abandoned mine workings manual*' (2019, Ref E), record that the 10:1 ratio is only a 'rule of thumb' and that other subsidence mechanisms can occur, for which the 10:1 ratio is not appropriate. SEL has summarised these factors in Table 4 (next page).

**Table 3. Summary of Other Potential Risks Associated with Coal Mining**

| Hazard | Assessment | Source |
|---|---|---|
| Depth of Workings | <2.70m | 2025 site investigations |
| Extraction Ratio | <10.0 to 1 | 2025 site investigations |
| Strata dip | 1 in 11 | Coal Authority records |
| Multiple Workings? | One seam workings | No other workings to 27.70m below Abdy (Bh1) |
| Roof Strata | Mainly on/close to outcrop | 2025 site investigations |
| Weathering/Voids | No | 2025 site investigations |

## 5.2 Mitigation Measures for Mine Entries (Adits)

Three trial pits were excavated to mitigate the risk from four recorded adits. Evidence for adits in trenches/trial pits usually takes the form of voids, heavily disturbed ground below rockhead and/or brickwork below rockhead.

***Trial Pit 1 (to prove adit 434404-14):*** adit located in trial pit (backfilled, 1.15m thickness proved. It is considered the risk from this mining legacy issue has not been mitigated.

***Trial Pit 2 (to prove adit 434404-13)*****:** encountered no disturbed ground / voids / brickwork. It is concluded that this adit is present in its recorded position at a depth unattainable by trial pitting. It is considered the risk from this mining legacy issue has not been mitigated.

***Trial Pit 3 (to prove adits 434404-05 and 434404-16)*****:** adits located in trial pit, both backfilled. Proven dimensions for adit *434404-16* were 1.90m thick and 1.50m wide. Proven dimensions for adit 434404-05 were 1.30m thick 1.40m wide. It is considered the risk from this mining legacy issue has not been mitigated.

Having reviewed all of the factors relating to the site, SEL conclude that **the risk from shallow mine workings and from adits 434404-05, 434404-13, 434404-14 and 434404-16 cannot be mitigated without further works being carried out**.

# 6.0 CONCLUSIONS & RECOMMENDATIONS

## 6.1 Shallow Mine Workings

In order to mitigate the risk from shallow mine workings, it is recommended the site is stabilised by a programme of proof grouting using a base drilling grid at 6.00m centres, augmented by extra drilling/grouting at intermediary locations where grout takes are high. Grouting should be undertaken to 1.00m below the base of the Abdy seam coal/workings, which lie at depths of between 2.30m and 3.50m begl (base of seam). Grouting should be initially limited to an area 5.00m beyond the footprint of the proposed property where it is feasible to do so[2]. These works should be carried out under a Coal Authority (Mining Remediation Authority) permit.

Consideration may be given to grouting some of the adit locations, should mine gas monitoring prove a potential hazard. If adits are encountered they should be sealed in accordance (and consultation) with Coal Authority (Mining Remediation Authority) requirements.

The Abandoned mine workings manual suggest raft foundations for low rise buildings can sometimes be considered. These would normally be placed under the footprint of the proposed on-site buildings only. However, consideration would need to be given to the potential for differential settlement and crown holing occurring along the edges of rafts which could potentially damage services and/or drainage to/from the properties.

## 6.2 Coal seam Outcrops

The Abdy coal seam outcrops across part of the site and may be encountered in development works. It is recommended that if encountered, coal is removed from below the proposed development to negate the risk from spontaneous combustion.

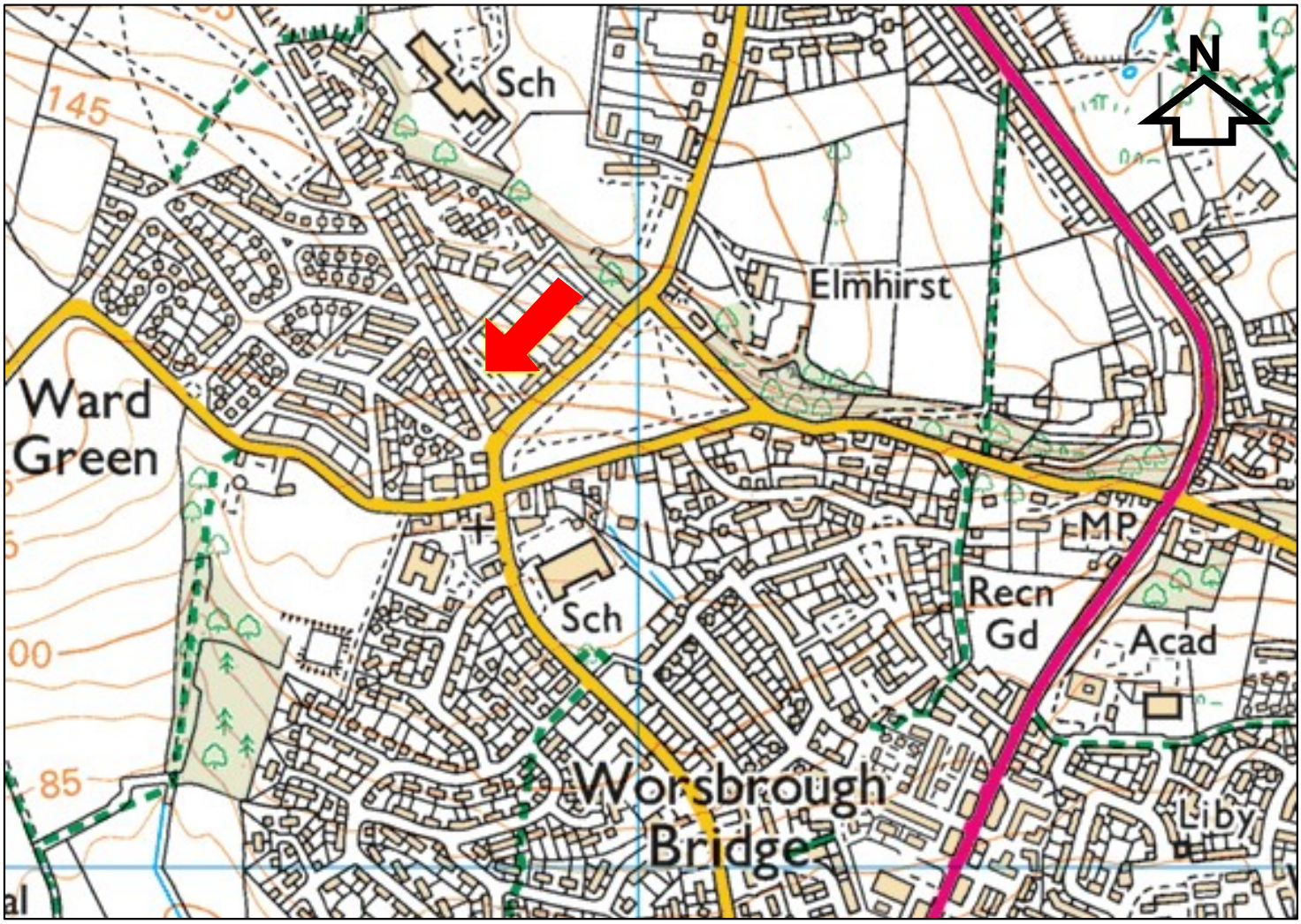
## 6.3 Mine Gas

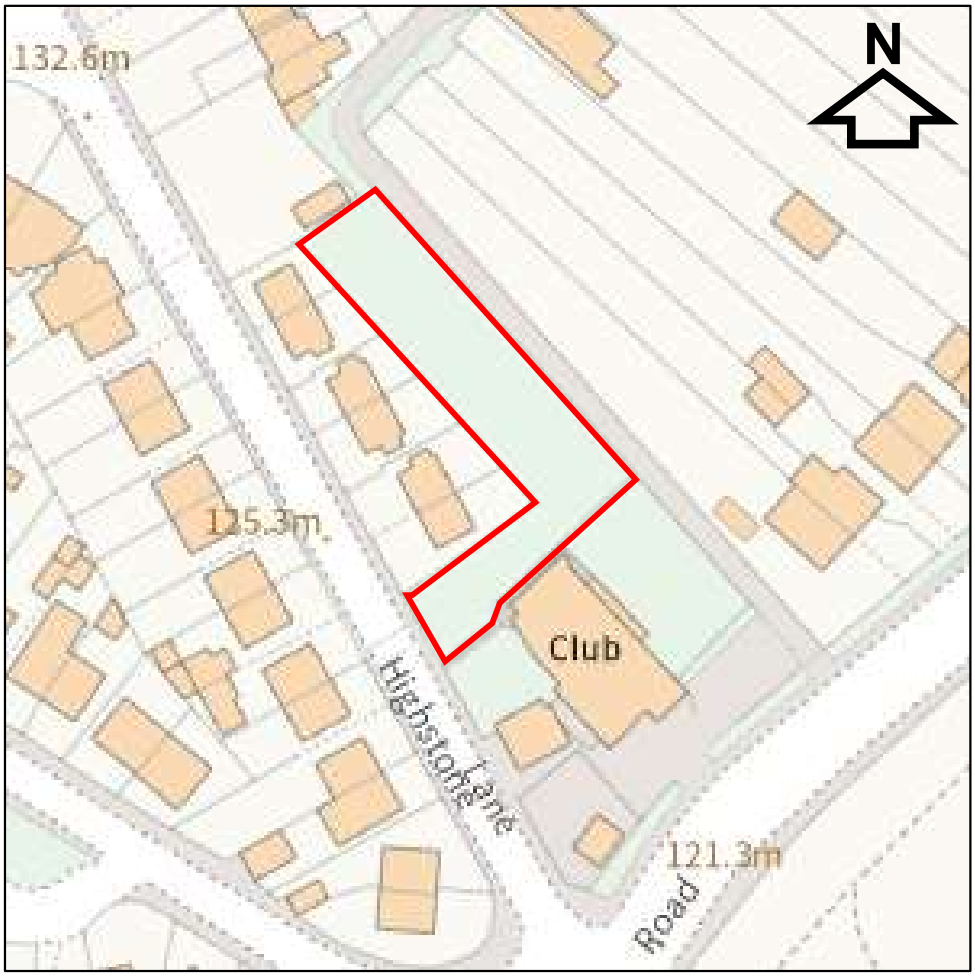
Gas monitoring equipment has been installed into the coal/old workings at three borehole locations to record the potential presence of mine gases in accordance with CIRIA guidance C665. Gas levels will be monitored for six visits over a period of three months as a minimum. A report assessing gas risk on site will be prepared on completion of the monitoring

[2] It is recognised that grouting may not be able to extend 5.00m beyond the footprint of the proposed building along certain boundaries and in such circumstances it is expected the grid would be extended to be as close to these boundaries as feasibly possible.

## APPENDIX A

## FIGURES




Site Location

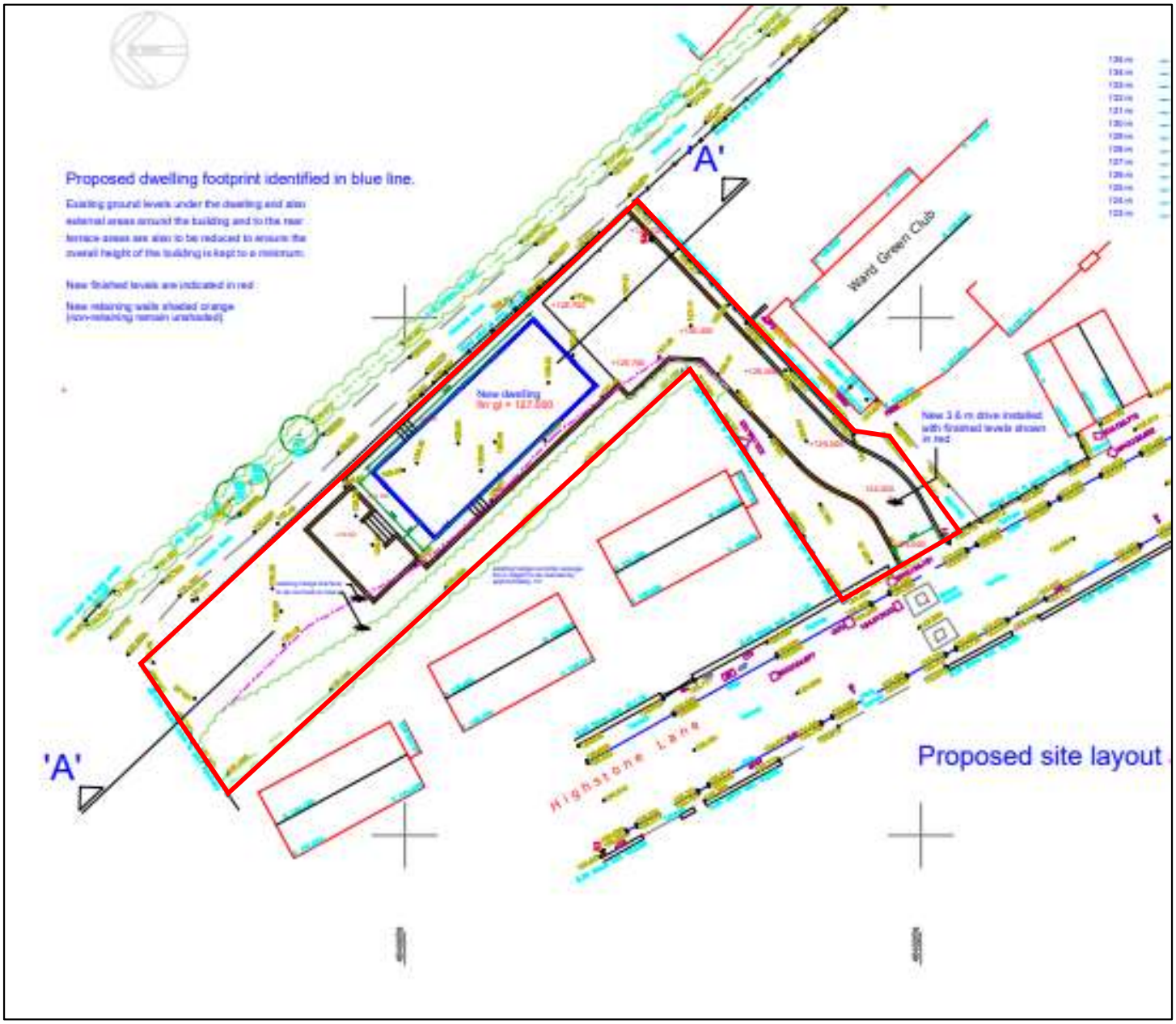
**Ref No. 24319**

**Highstone Lane,**
**Worsbrough,**
**Barnsley,**
**South Yorkshire,**
**S70 6SD**

**Figure 1:**

**SITE LOCATION**

**(NGR 434830,404550)**




It is proposed to construct a low rise detached dwelling incorporating an access drive and parking provision, with gardens and a terrace to the rear.

The FFL of the dwelling will be at approximately 127.0m AOD, necessitating retention of the adjacent ground by between 1 and 2m height.

Planning permission was submitted to Barnsley Metropolitan Borough Council for the development of 1 no. detached dwelling in September 2023 (still under consideration).

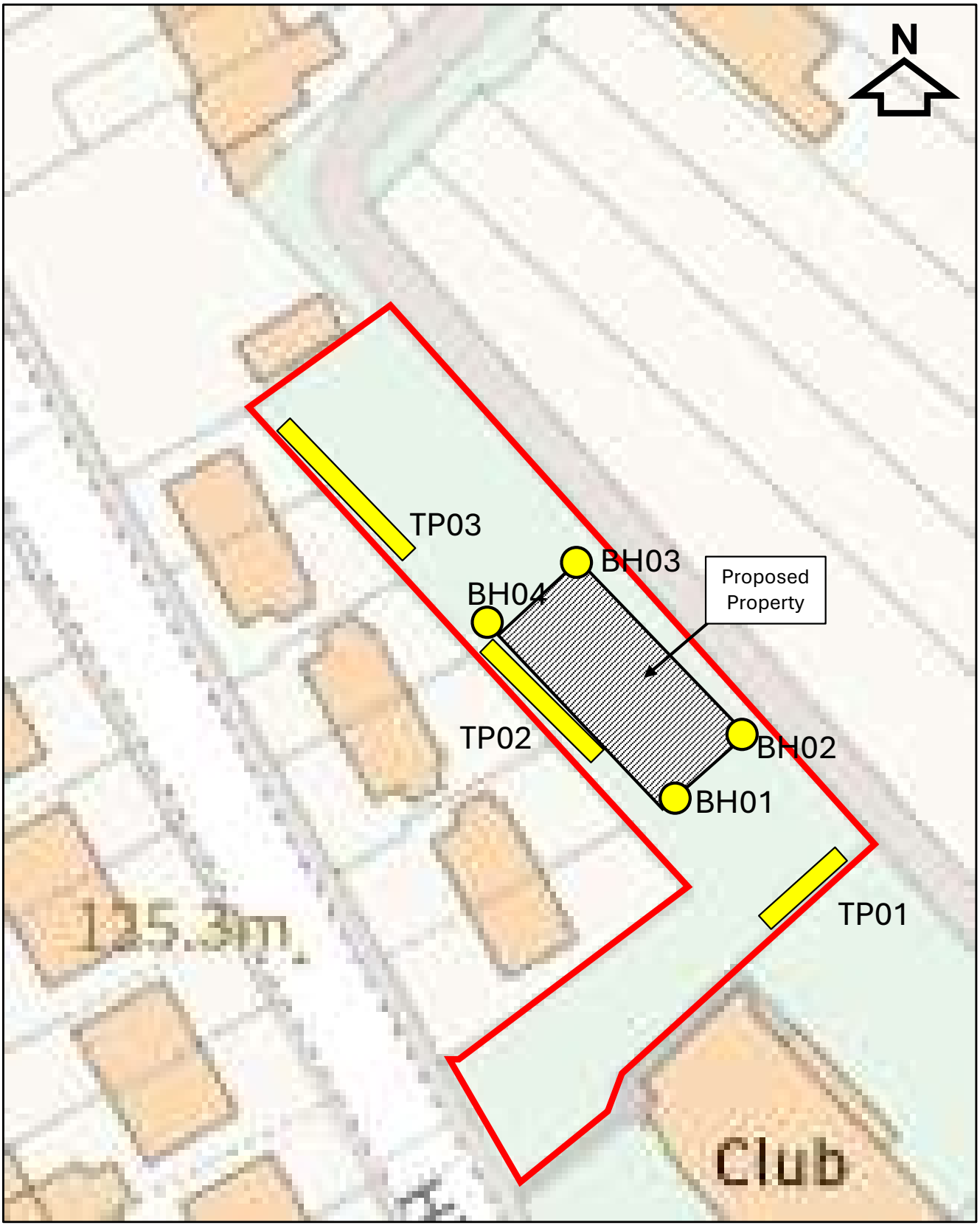
**Ref No. 24319**

**Highstone Lane,**
**Worsbrough,**
**Barnsley,**
**South Yorkshire,**
**S70 6SD**

**Figure 2:**

**PROPOSED SITE LAYOUT**

**(NGR 434830,404550)**




**Key:**

**BH01** Rotary Borehole Location

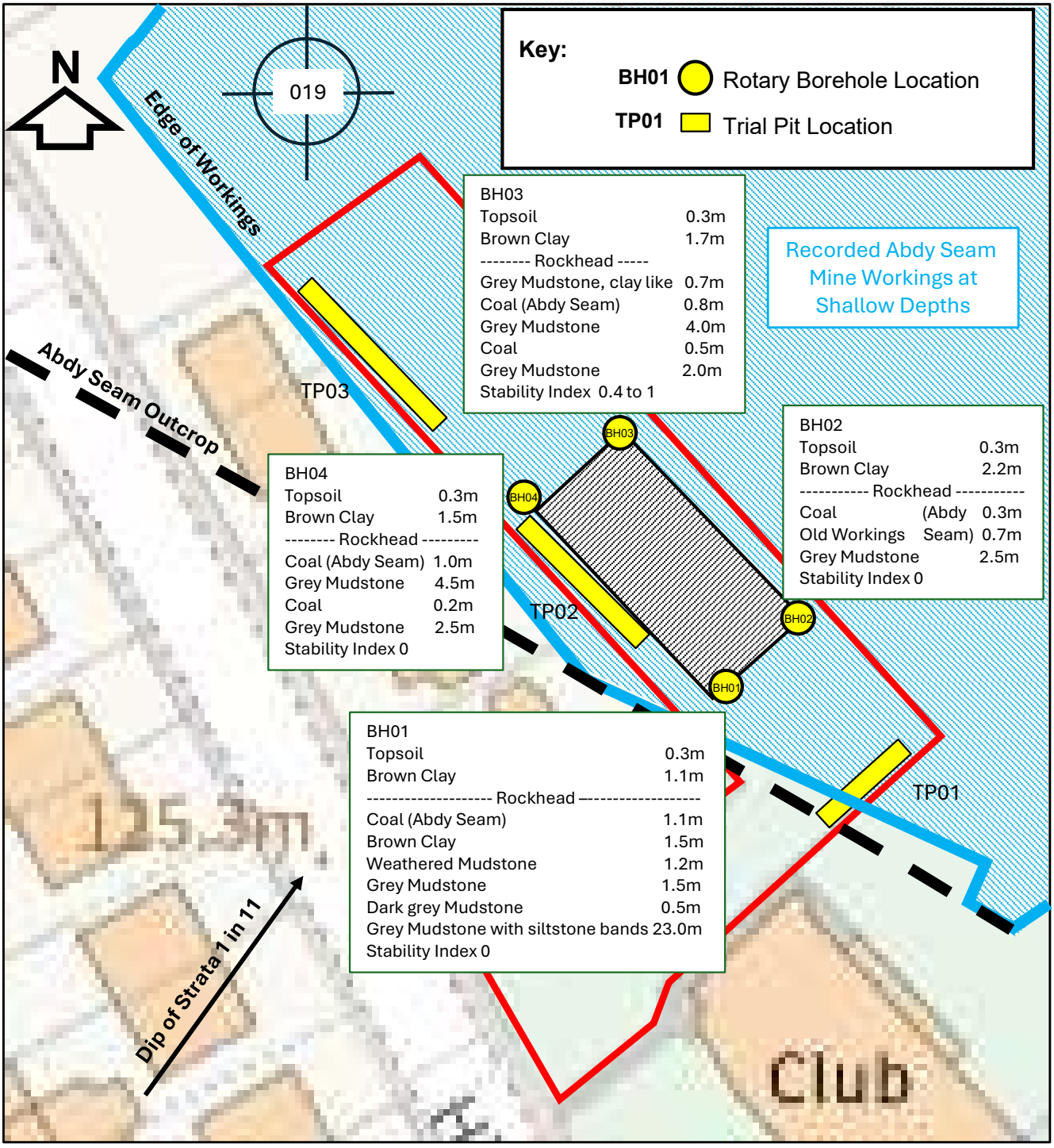
**TP01** Trial Pit Location

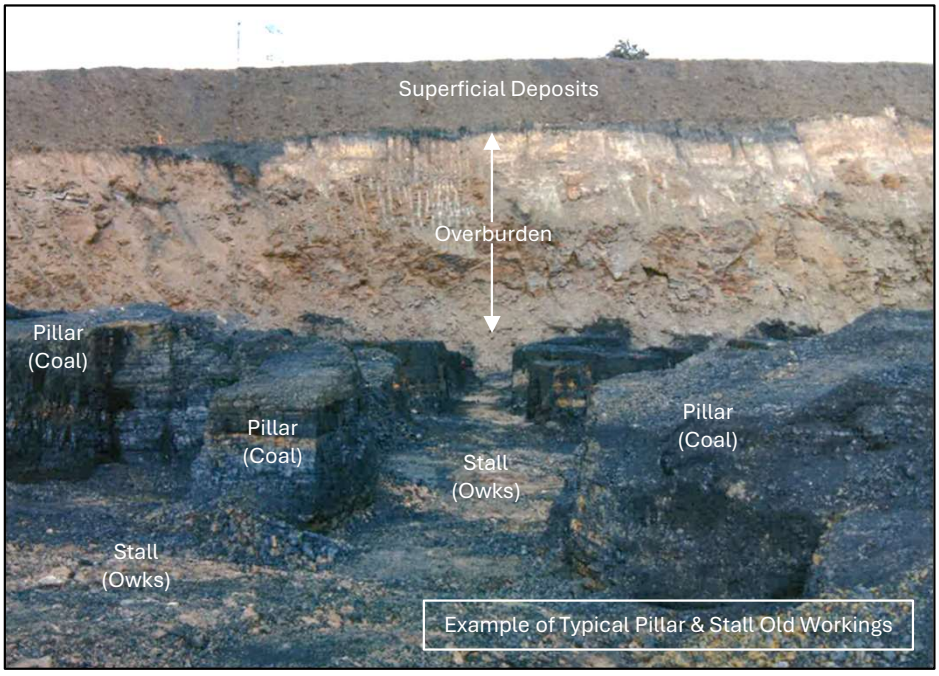
**Ref No. 24319**
**Highstone Lane,**
**Worsbrough,**
**Barnsley,**
**S70 6SD**

**Figure 3:**

**LOCATION OF SITE INVESTIGATIONS**

**(NGR 434830,404550)**



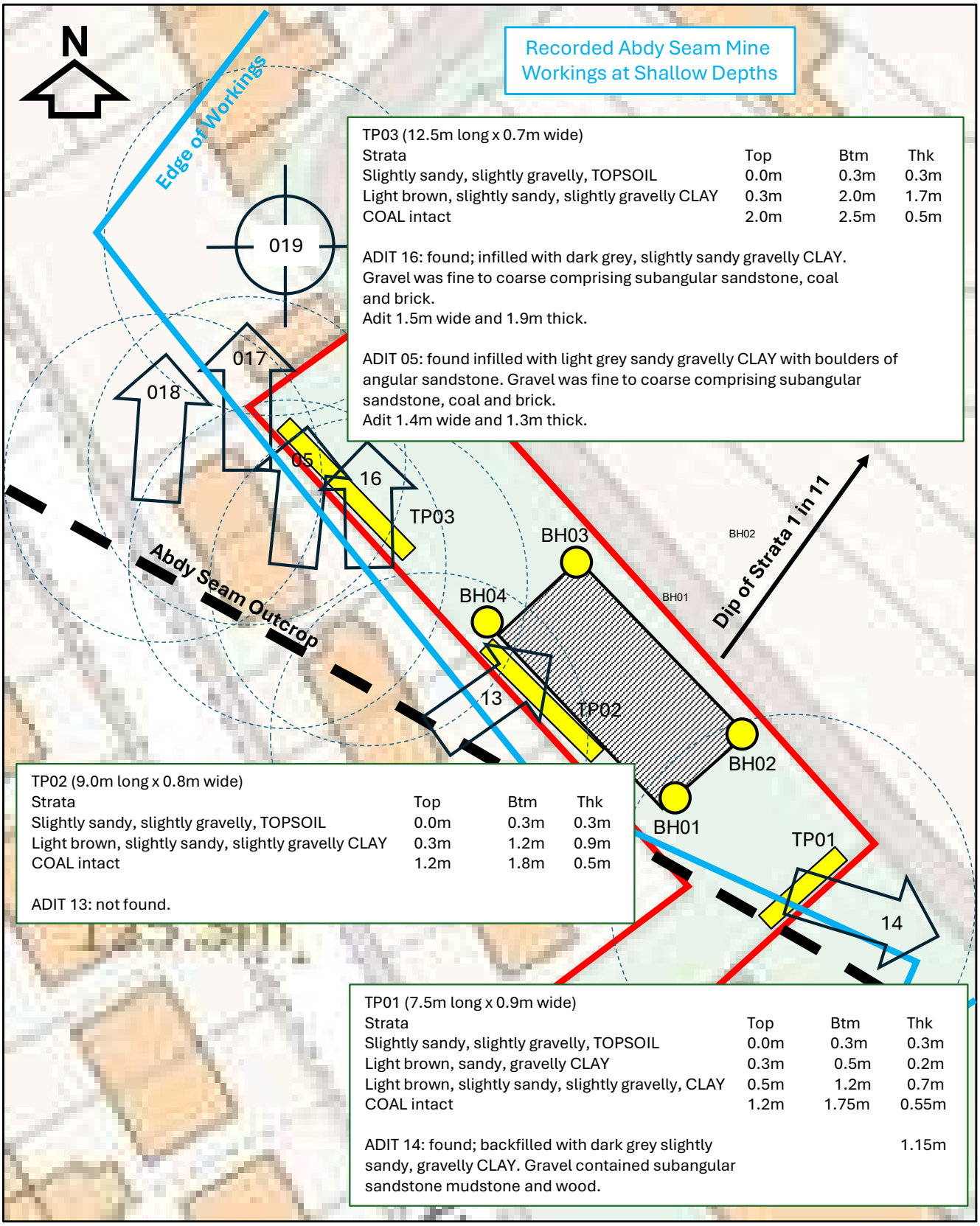




**Ref No. 24319**
**Highstone Lane,**
**Worsbrough,**
**Barnsley,**
**S70 6SD**

**Figure 4:**

**INTERPRETATION OF ROTARY DRILLING**

**(NGR 434830,404550)**




**Key:**

**BH01** Rotary Borehole Location

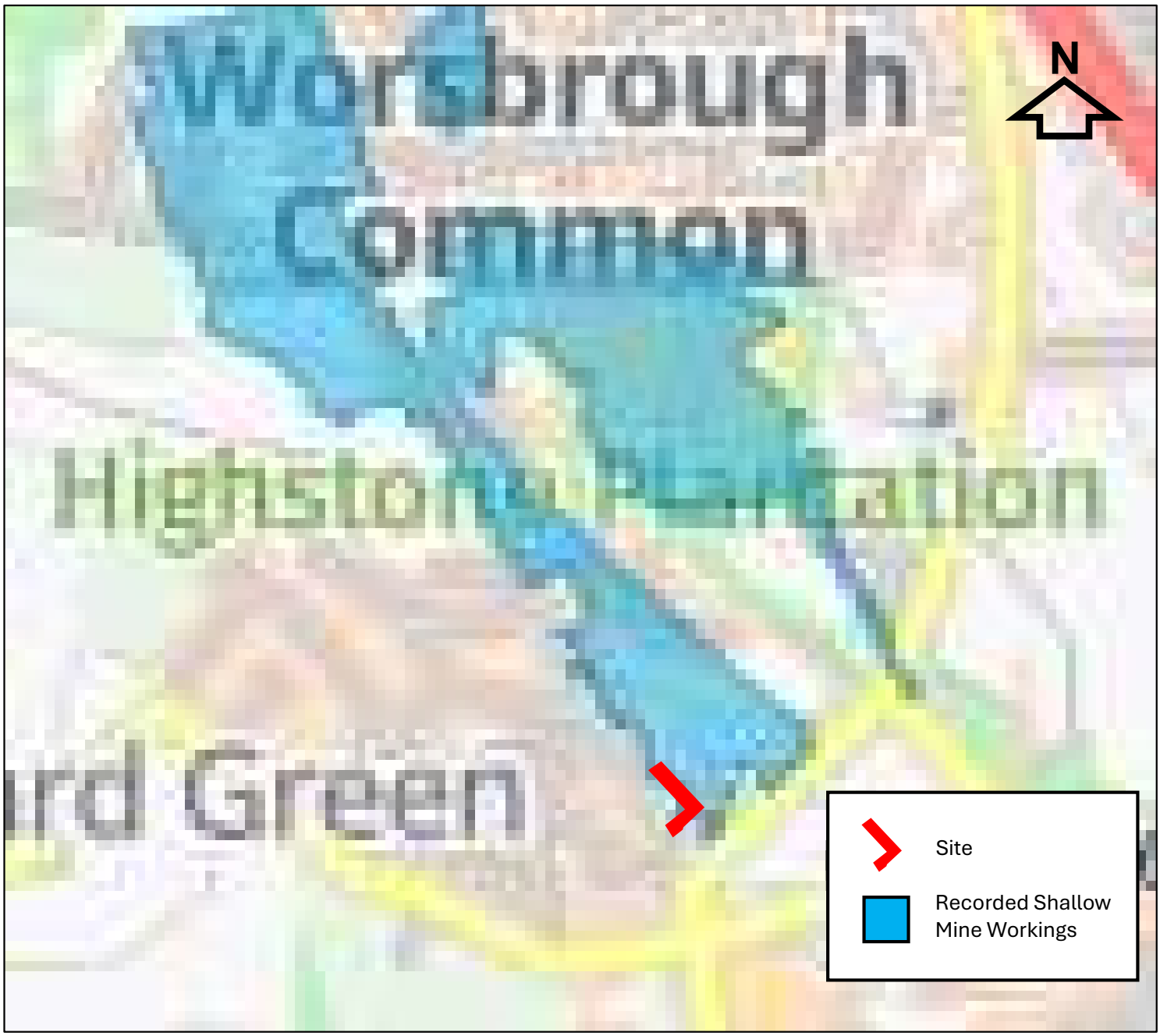
**TP01** Trial Pit Location

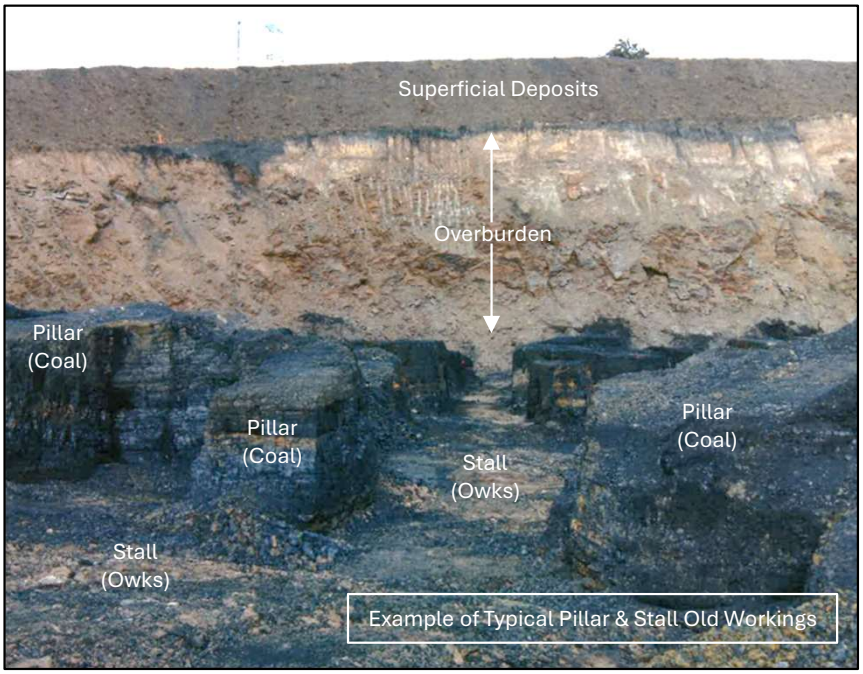
**Ref No. 24319**
**Highstone Lane,**
**Worsbrough,**
**Barnsley,**
**S70 6SD**

**Figure 5:**

**INTERPRETATION OF TRIAL PITS**

**(NGR 434830,404550)**




**Ref No. 24319**
**Highstone Lane,**
**Worsbrough,**
**Barnsley,**
**S70 6SD**

**Figure 6:**

**RECORDED OLD WORKINGS IN ABDY SEAM**

**(NGR 434830,404550)**

# APPENDIX B

## Rotary Drilling Logs

**Silkstone**
Environmental Ltd
www.silkstoneenvironmental.co.uk

Silkstone Environmental Ltd
7 Hall Annex, Thorncliffe Park
Chapeltown, S35 2PH
Telephone: 0114 2573487

# BOREHOLE LOG

| Project | | | | BOREHOLE No |
|---|---|---|---|---|
| Highstone Lane, Worsbrough, Barnsley | | | | **BH01** |
| Job No | Date | Ground Level (m) | Co-Ordinates () | |
| 24319 | 24-02-25 | | | |
| Contractor | | | | Sheet |
| Ace Drilling Services Ltd | | | | 1 of 2 |

| SAMPLES & TESTS | | | Water | STRATA | | | | Geology | Instrument/ Backfill |
|---|---|---|---|---|---|---|---|---|---|
| Depth | Type No | Test Result | | Reduced Level | Legend | Depth (Thick-ness) | DESCRIPTION | | |
| | | | | | | 0.30 | Topsoil | | |
| | | | | | | (0.90) 1.20 | Brown Clay (drillers description) | | |
| | | | | | | (1.10) 2.30 | COAL (drillers description) | | |
| 2.20 | | N6 | | | | | Brown clay (drillers description) | | |
| 3.20 | | N41 | | | | (1.50) 3.80 | | | |
| | | | | | | (1.20) 5.00 | Weathered mudstone (drillers description) | | |
| | | | | | | (1.50) 6.50 | Grey mudstone (drillers description) | | |
| | | | | | | 7.00 | Dark grey mudstone (drillers description) | | |
| | | | | | | | Grey mudstone with bands of siltstone (drillers description). | | |

| Boring Progress and Water Observations | | | | | | Chiselling | | | Water Added | |
|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth | Casing Depth | Casing Dia. mm | Water Dpt | From | To | Hours | From | To |
| | | | | | | | | | | |

**GENERAL REMARKS**

1. Hand dug pit followed by rotary open hole drilling using water flush.
2. No groundwater.
3. No visual or olfactory evidence of potential contamination.

| All dimensions in metres Scale 1:93.75 | Client Peter Dimberline Ltd | Method/ Plant Used Beretta GT54-6 | Logged By JC |
|---|---|---|---|

**Silkstone**
Environmental Ltd
www.silkstoneenvironmental.co.uk

Silkstone Environmental Ltd
7 Hall Annex, Thorncliffe Park
Chapeltown, S35 2PH
Telephone: 0114 2573487

# BOREHOLE LOG

| Project | | | | BOREHOLE No |
|---|---|---|---|---|
| Highstone Lane, Worsbrough, Barnsley | | | | **BH01** |
| Job No | Date | Ground Level (m) | Co-Ordinates () | |
| 24319 | 24-02-25 | | | |
| Contractor | | | | Sheet |
| Ace Drilling Services Ltd | | | | 2 of 2 |

| SAMPLES & TESTS | | | Water | STRATA | | | | Geology | Instrument/ Backfill |
|---|---|---|---|---|---|---|---|---|---|
| Depth | Type No | Test Result | | Reduced Level | Legend | Depth (Thick-ness) | DESCRIPTION | | |
| | | | | | | (23.00) | Grey mudstone with bands of siltstone (drillers description). *(continued)* | | |
| | | | | | | 30.00 | | | |

| Boring Progress and Water Observations | | | | | | Chiselling | | | Water Added | |
|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth | Casing Depth | Casing Dia. mm | Water Dpt | From | To | Hours | From | To |
| | | | | | | | | | | |

**GENERAL REMARKS**

1. Hand dug pit followed by rotary open hole drilling using water flush.
2. No groundwater.
3. No visual or olfactory evidence of potential contamination.

| All dimensions in metres Scale 1:93.75 | Client Peter Dimberline Ltd | Method/ Plant Used Beretta GT54-6 | Logged By JC |
|---|---|---|---|

**Silkstone**
Environmental Ltd
www.silkstoneenvironmental.co.uk

Silkstone Environmental Ltd
7 Hall Annex, Thorncliffe Park
Chapeltown, S35 2PH
Telephone: 0114 2573487

# BOREHOLE LOG

| Project | | | | BOREHOLE No |
|---|---|---|---|---|
| Highstone Lane, Worsbrough, Barnsley | | | | **BH02** |
| Job No | Date | Ground Level (m) | Co-Ordinates () | |
| 24319 | 25-02-25 | | | |
| Contractor | | | | Sheet |
| Ace Drilling Services Ltd | | | | 1 of 1 |

| SAMPLES & TESTS | | | Water | STRATA | | | | | Geology | Instrument/ Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Type No | Test Result | | Reduced Level | Legend | Depth (Thick-ness) | DESCRIPTION | | | |
| | | | | | | 0.30 | Topsoil | | | |
| | | | | | | (2.20) | Brown clay (drillers description) | | | |
| | | | | | | 2.50 | | | | |
| | | | | | | 2.80 | Coal (drillers description) | | | |
| | | | | | | 3.50 | Workings (drillers description) | | | |
| | | | | | | (2.50) | Grey mudstone (drillers description) | | | |
| | | | | | | 6.00 | | | | |

| Boring Progress and Water Observations | | | | | | Chiselling | | | Water Added | | GENERAL REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth | Casing Depth | Casing Dia. mm | Water Dpt | From | To | Hours | From | To | 1. Hand dug pit followed by rotary open hole drilling using water flush.<br>2. No groundwater.<br>3. No visual or olfactory evidence of potential contamination. |
| | | | | | | | | | | | |

| All dimensions in metres<br>Scale 1:93.75 | Client Peter Dimberline Ltd | Method/ Plant Used Beretta GT54-6 | Logged By JC |
|---|---|---|---|

BH LOG 15M 24319 HIGHSTONE LANE, WORSBROUGH ROBH.GPJ GINT STD AGS 3_1.GDT 27/3/25

**Silkstone**
Environmental Ltd
www.silkstoneenvironmental.co.uk

Silkstone Environmental Ltd
7 Hall Annex, Thorncliffe Park
Chapeltown, S35 2PH
Telephone: 0114 2573487

# BOREHOLE LOG

| Project | | | | BOREHOLE No |
|---|---|---|---|---|
| Highstone Lane, Worsbrough, Barnsley | | | | **BH03** |
| Job No | Date | Ground Level (m) | Co-Ordinates () | |
| 24319 | 25-02-25 | | | |
| Contractor | | | | Sheet |
| Ace Drilling Services Ltd | | | | 1 of 1 |

| SAMPLES & TESTS | | | Water | STRATA | | | | Geology | Instrument/ Backfill |
|---|---|---|---|---|---|---|---|---|---|
| Depth | Type No | Test Result | | Reduced Level | Legend | Depth (Thick-ness) | DESCRIPTION | | |
| | | | | | | 0.30 | Topsoil | | |
| | | | | | | (1.70) | Brown clay (drillers description) | | |
| | | | | | | 2.00 | | | |
| 2.20 | | N17 | | | | 2.70 | Grey clay like mudstone (drillers description) | | |
| 2.80 | | N50/ 155 mm | | | | (0.80) | Coal (drillers description) | | |
| | | | | | | 3.50 | | | |
| | | | | | | (4.00) | Grey mudstone (drillers description) | | |
| | | | | | | 7.50 | | | |
| | | | | | | 8.00 | Coal (drillers description) | | |
| | | | | | | (2.00) | Grey mudstone (drillers decription) | | |
| | | | | | | 10.00 | | | |

| Boring Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Depth | Casing Depth | Casing Dia. mm | Water Dpt |
| | | | | | |

| Chiselling | | | Water Added | |
|---|---|---|---|---|
| From | To | Hours | From | To |
| | | | | |

**GENERAL REMARKS**

1. Hand dug pit followed by rotary open hole drilling using water flush.
2. No groundwater.
3. No visual or olfactory evidence of potential contamination.

| All dimensions in metres Scale 1:93.75 | Client Peter Dimberline Ltd | Method/ Plant Used Beretta GT54-6 | Logged By JC |
|---|---|---|---|

BH LOG 15M 24319 HIGHSTONE LANE, WORSBROUGH ROBH.GPJ GINT STD AGS 3_1.GDT 27/3/25

**Silkstone**
Environmental Ltd
www.silkstoneenvironmental.co.uk

Silkstone Environmental Ltd
7 Hall Annex, Thorncliffe Park
Chapeltown, S35 2PH
Telephone: 0114 2573487

# BOREHOLE LOG

| Project | | | | BOREHOLE No |
|---|---|---|---|---|
| Highstone Lane, Worsbrough, Barnsley | | | | **BH04** |
| Job No | Date | Ground Level (m) | Co-Ordinates () | |
| 24319 | 26-02-25 | | | |
| Contractor | | | | Sheet |
| Ace Drilling Services Ltd | | | | 1 of 1 |

| SAMPLES & TESTS | | | Water | STRATA | | | | Geology | Instrument/ Backfill |
|---|---|---|---|---|---|---|---|---|---|
| Depth | Type No | Test Result | | Reduced Level | Legend | Depth (Thick-ness) | DESCRIPTION | | |
| | | | | | | 0.30 | Topsoil | | |
| | | | | | | | Brown clay (drillers description) | | |
| | | | | | | (1.50) | | | |
| | | | | | | 1.80 | | | |
| 1.80 | | N14 | | | | | Coal (drillers description) | | |
| | | | | | | (1.00) | | | |
| 2.60 | | N13 | | | | 2.80 | | | |
| | | | | | | | Grey mudstone (drillers description) | | |
| 3.60 | | N50/ 125 mm | | | | | | | |
| | | | | | | (4.50) | | | |
| | | | | | | 7.30 | | | |
| | | | | | | 7.50 | Coal (drillers description) | | |
| | | | | | | | Grey mudstone (drillers description) | | |
| | | | | | | (2.50) | | | |
| | | | | | | 10.00 | | | |

| Boring Progress and Water Observations | | | | | |
|---|---|---|---|---|---|
| Date | Time | Depth | Casing Depth | Casing Dia. mm | Water Dpt |
| | | | | | |

| Chiselling | | | Water Added | |
|---|---|---|---|---|
| From | To | Hours | From | To |
| | | | | |

**GENERAL REMARKS**

1. Hand dug pit followed by rotary open hole drilling using water flush.
2. No groundwater.
3. No visual or olfactory evidence of potential contamination.

| All dimensions in metres Scale 1:93.75 | Client Peter Dimberline Ltd | Method/ Plant Used Beretta GT54-6 | Logged By JC |
|---|---|---|---|

# APPENDIX C

## Trial Pit Photographic Record

Photo 1: TP01 – Large wood fragments found within adit 14.

Photo 2: TP01 – Dark coloured infill material within the natural light brown strata.

Photo 3: TP01 – Dark coloured infill material within the natural light brown strata.

Photo 4: TP01 – Dark coloured infill material within the natural light brown strata.

Photo 5: TP02 – Overview of the trial pit.

Photo 6: TP03 – Large sandstone boulders and light grey backfill (adit 05) within the light brown natural strata.

Photo 7: TP03 – Darker coloured backfill material with fragments of brick (adit 16) within the light brown natural strata.

Photo 8: TP03 – Darker coloured backfill material with fragments of brick (adit 16) within the light brown natural strata.