Ground Investigation Technical Report

Infill Development Adjacent
118 Drub Lane,
Drub,
Cleckheaton,
BD19 4BU.

Introduction

The purpose of the investigation was to evaluate the ground conditions at the position of rotary boreholes to determine the presence of any shallow coal seams and associated mine workings in order to assess the risk to near surface ground stability of an area of land adjacent to 118 Drub Lane, Drub, Cleckheaton, BD19 4BU.

The aim of the investigation and this subsequent technical report is to discharge the pre-commencement condition (a scheme of intrusive site investigations) of the Kirklees Council approved planning permission 2019/62/92726/E dated 30th October 2019.

Site Description & Proposed Development

The site is located to the centre of the established West Yorkshire village of Drub, which is located approximately ¾ of a mile to the north of Cleckheaton town centre, the site is located to the south side of Drub Lane and is approximately 9M wide x 30m deep located between two existing residential dwellings of 118 & 120 Drub Lane and is currently an area of private gardens that was previously occupied by a concrete sectional garage in the ownership of 118 Drub Lane, the site is accessed directly from Drub Lane via an existing vehicle drop crossing. The site gently falls to the southwest, the site is located at an approximate elevation of 126m above Ordnance Datum (AOD).

The site is located on the British Geological Survey 1:10,000 scale map reference: SE12NE Cleckheaton.

The proposed development is for the construction of one detached dwelling, with parking and private gardens to an area of land adjacent to 118 Drub Lane, Drub, Cleckheaton, BD19 4BU.

Investigation Details

The site investigation works were undertaken by GSS UK on the 15th September 2020 under Coal Authority Permit No 20354 granted on 12th August 2020. Five rotary boreholes (R1 to R5) were advanced to depths ranging from 12.10 metres to 13.00 bgl using a Hutte drilling rig at positions shown on the Site Investigation Boreholes Plan (see Drawing No 9001-002-1 Rev O). The rotary boreholes were advanced by rotary open holing techniques, with a water flush medium using 100mm diameter rock roller bits. The foreman driller logged chippings flushed to the surface during drilling and the resulting Rotary Drilling Log Sheet is appended. On completion the rotary boreholes were backfilled with arisings and grout as no installations were required.

Gas monitoring was carried out during drilling, no Methane CH^4 or Carbon Dioxide CO^2 was detected whilst drilling through coal strata, these measurements being associated with levels of Oxygen O^2 of 20.8%

The initial intension was for borehole R1 to be drilled down to depth of 30 metres and boreholes R2, R3, R4 & R5 to be drilled to a depth 15.00 metres but due to the loss of flush medium the boreholes could not be advanced beyond 13.00 metres.

Sub Surface Details

Details of the strata encountered in the ground investigation are given on the appended Rotary Drilling Log Records and summarised below:-

Borehole R1	0.00 – 1.60	Clay
	1.60 – 9.40	Sandstone
	9.40 – 12.00	Broken Ground
	12.00 – 13.00	Hard Strata
Borehole R2	0.00 – 1.50	Clay
	1.50 – 8.80	Sandstone
	8.80 – 11.10	Broken Ground
	11.10 – 12.10	Hard Strata
Borehole R3	0.00 – 1.50	Clay
	1.50 – 10.20	Sandstone
	10.20 – 12.00	Coal
	12.00 – 13.00	Sandstone
Borehole R4	0.00 – 1.60	Clay
	1.60 – 8.50	Sandstone
	8.50 – 11.20	Broken Ground
	11.20 – 12.20	Hard Strata
Borehole R5	0.00 – 1.60	Clay
	1.60 – 10.00	Sandstone
	10.00 – 11.60	Broken Ground
	11.60 – 12.60	Hard Strata

Geology

Geological maps indicate the site to be underlain by undifferentiated sedimentary of mudstone, siltstones and minor sandstones of the Westphalian Coal Measures of the Upper Carboniferous Period, there are no faults affecting the site and there is no drift cover.

The Middleton Main Coal seam is indicated to outcrop some 195m to the southwest of the site at an approximate ground level of 115.00m AOD. If the seam was horizontal and as the site lies at an elevation of 126.00m AOD it would therefore be

anticipated at 11.00m below the site, Vertical Section 1;10,000 map indicates the seam thickness in the range of 0.8m to 1.4m.

The Wheatley Line Coal is the next shallowest seam, it is indicated to be up to 1.1m thick and outcrops 340m to the southwest at an elevation of 105.00m and some 10.00m below the Middleton Main.

The Coal Authority have no records of mine workings to 110.00 metres depth. However, it is considered that unrecorded mine workings are likely to be present at shallower depths as records shows the site is in a "Development High Risk Area" located within an area where coal is believed to be present at or close to the surface, which may have been worked at sometime in the past.

Finding of Rotary Borehole Investigation

For Boreholes R1, R2, R4 & R5 the base of the approximately 0.8 to 1.4 metre thick Middleton Main Coal seam was anticipated to be at about 11 metres depth. Mine workings at this horizon were found to be between 1.60 to 2.70 metres thick with their bases at between 11.10 to 12.00 metres depth.

For Borehole R3 a pillar of the Middleton Main Coal seam was found intact at a thickness of 1.8 metres with its base at 12.00 metres depth.

Conclusions and Recommendations

It is considered that the abandoned mine workings in the Middleton Main Coal seam are of such depth and character that they present a significant risk to ground stability and the integrity of the proposed dwelling.

Problems of stability arise when the residual collapse of broken strata within or above the mined horizon migrates upwards through the roof strata. The resulting settlement feature may be a distinct crownhole or a less noticeable depression due to differential settlement. While it is not possible to predict residual settlement of abandoned mine workings the risk may be increased by the stresses imposed by surface load, settlement can and does occur irrespective of ground surface loads.

It is recommended the ground within and above the shallow mined horizon be proved to be stable or rendered stable by drilling and grouting. Given the broken ground found holes should be drilled to just below the base of the mined horizon on a 3.0 metre grid pattern in relation to the planned footprint of the proposed dwelling extending beyond the perimeter as indicated on the Rotary Drilling/Grouting Grid Plan (see Drawing No 9001-003-1 Rev O). Grout (liquid mixture of Pulverised Fuel Ash (PFA), cement and water) should then be injected through each drill hole under appropriate pressure to stabilise the broken ground encountered. Where excessive lateral flow of grout is anticipated or when voids greater than 500mm are encountered sand or pea gravel may be added to the grout mix in accordance with CIRIA SP32.

Additionally for the verification of grout spread purposes and for investigation of the Wheatley Line Coal seam three additional boreholes (C1 to C3) to be drilled across the area of development to a depth that intercepts the Wheatley Line Coal seam at a anticipated at 21.0 metres depth (following stabilisation of the Middleton Main Coal seam workings and taking the generally accepted rule of thumb that if there is ten times the seam thickness of rock cover above the Wheatley Line Coal seam it is anticipated that there should be no requirment for further ground stabilisation), on completion these boreholes to be backfilled with grout.

Prior written permission from The Coal Authority is required for intrusive activities which will disturb or enter coal seams, coal mine workings or coal mine entries (shafts and adits).

Foundations

Following the stabilisation works the most suitable foundations for this development are considered to be strip footings thickened to 300mm and reinforced with B785 mesh top and bottom (50mm cover) due to the shallow coal workings. These should be taken through any made or soft ground and into the natural firm clay, at a minimum depth of 900mm below the proposed ground level, or natural sandstone at a minimum depth of 600mm.

Foundation within clay soils will need to be deepened in accordance with NHBC Standards, Chapter 4.2 where existing or proposed are within influence distance. Heave precautions will be required where foundations are more than 1500mm deep due to trees. However, due to the shallow nature of the sandstone, the clay is unlikely to extend this deep across the site.

Appendices

- GSS UK Rotary Drilling Log Records
- Coal Authority Permit No 20354