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Mr G Rhodes
Barratt Homes and David Wilson Homes West Yorkshire
Raynham House
2 capitol Close
Morley
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LS27 0WH

2nd May 2017

Our Ref: C6138B/MB/6765 rev3

Dear Graham

Re: C6138B, Carrs Lane, Cudworth, Barnsley – Supplementary Mining Investigation

1.0 Introduction

Sirius Geotechnical and Environmental Ltd (Sirius) were commissioned by Barratt & David Wilson Homes (BDW) to undertake a supplementary mining investigation of land off Carrs Lane, Cudworth, Barnsley, South Yorkshire (the "site").

It is understood that BDW are considering developing the site for a low-rise residential end-use, comprising 263 two storey residential properties and 15 bungalows, with private gardens, areas of soft landscaping, Public Open Space (POS), areas of hardstanding, and highways. A proposed development layout plan (as reproduced from Urban Design's Site Layout Plan, ref. YW-04-03, Revision AA, dated 25th April 2017) is included in Appendix A, as Drawing No. C6138B/02. No loadings or development levels were known at the time of writing.

Sirius has previously compiled a supplementary mining risk assessment for the site in May 2015 (Letter Ref. C6138B/MB/6765). Since the issue of the letter report the development layout, including the south eastern and south western site boundaries, have altered slightly and subsequently the development area has reduced. This current letter report makes reference to the updated development layout, however the conclusions and recommendations given within are based on the original, larger development area. Therefore this letter report should be read with consideration to the revised development layout plan. In addition, the revised proposed development includes for an attenuation pond within the far southern part of the site. Geotechnical recommendations for this feature are beyond the remit of this report and it is understood that this will be undertaken

by others.

Sirius has previously compiled a Preliminary Appraisal (desk study) Report and Geoenvironmental Appraisal Report (refs. C6138 Rev2 dated April 2017 and C6138A Rev 2 dated April 2017, respectively) for the site on behalf of BDW. These reports identified a potential risk to the surface stability of the site (more significantly within the western part) from possible mineworkings within the Sharlston Low coal seam. The aim of this supplementary mining investigation was to confirm with greater confidence the absence, or otherwise, of shallow mineworkings within influential depth of the surface, and provide advice with regards remedial measures, if required.

The supplementary mining investigation has now been undertaken and the results presented below. This letter report should be read in conjunction with the above reports.

2.0 Background

Site Description

The site is located off Carrs Lane, Cudworth, approximately 4km north east of Barnsley town centre. A site location plan is included as Drawing No. C6138B/01 within Appendix A.

The site forms an irregular shaped plot of land, which broadly slopes downwards from north to south east, from an elevation of 58.9m AOD to 35.2m AOD, respectively. The north western part of the site slopes downward from north to south west, with an elevation difference of c. 17m.

The site generally comprises a set of agricultural fields defined by a combination of semi-mature / mature trees and low-lying shrubs. A set of electricity pylons are recorded within the southern portion of the site, aligned east to west and north to south.

The north western perimeter of the site forms part of a presumed historical quarry high wall; vertical remnants of the quarry high wall are visible. The quarry high wall has an elevation difference of between c. 1.50m and 20m between the site and the base of the quarry / former dismantled railway line to the west. In addition, along part of the site's western / north western boundary is a brick retaining wall, between c. 0.50m and 1.50m high. The retaining wall was noted to be in relatively 'good' condition, apart from some minor evidence of cracking.

Previous Ground Investigations

A summary of information pertinent to this mining investigation contained within the 2015 desk study and geoenvironmental appraisal is provided below:

- Published geological information indicates the site to be underlain by a combination of sandstone (Glass Houghton Rock) and undifferentiated strata (Pennine Middle Coal Measures). The Glass Houghton Rock is recorded across the majority of the site, with the Pennine Middle Coal Measures shown within the western portion.

  An un-named fault, aligned approximately north east/south west, is conjectured within the far north western portion of the site, downthrowing strata to the north west.

  The Sharlston Low coal seam (reported to be 0.30m to 0.48m thick) is conjectured to outcrop within, and adjacent to, the western portion of the site within the southern and northern fault blocks, respectively. The coal seam is recorded to be dipping to the east (below the site).

The Sharlston Top coal seam (reported to be 0.69m to 1.07m thick) is shown to outcrop on and / or around the eastern boundary of the site, within the southern fault block, again dipping to the east (away from the site).

No superficial deposits are shown to underlie the site.

- Information provided by the Coal Authority (CA) indicates that there is 1 known coal mine entry (CA Ref. 438408-00) within, or within 20 metres of, the boundary of the property. This feature is recorded c. 20m to the south west of the site and coincides with a former airshaft, as seen within historical OS mapping. There is no record of what steps, if any have been taken to treat the mine entry.

- Fieldwork forming part of the October 2014 ground investigation undertaken by Sirius comprised the mechanical excavation of 37 trial pits (TP1 to TP37) and six trial trenches (TT1 to TT6), the boring of 10 window samples (WS1 to WS10), and the drilling of eight rotary probeholes (RO1 to RO7, and RO1A).

- The site was found to be underlain by reworked topsoil, and locally made ground, to depths between 0.15m and 0.55m bgl, which in turn was found to be underlain by granular, and locally cohesive, residual soils. Bedrock, generally described as extremely / very weak and weak sandstone, with interbeds of siltstone, mudstone and coal, was proven at depths of between 0.50m and 2.80m bgl.

  Rotary drilling undertaken at the site identified one coal seam at depths of between 3.85m and 26.80m bgl (at levels of between 25.19m and 35.25m AOD), with recorded thicknesses of between 0.35m and 0.70m. This coal seam was considered representative of the Sharlston Low Coal.

  Based on the rotary drilling completed, the Sharlston Low coal seam is near to crop to the sites western boundary and appeared to be dipping at approximately 3.5° to 4.0° to the south east.

  A 0.8m thick zone of broken ground was recorded at the anticipated depth of the Sharlston Low coal seam in R03 (28m bgl~26.7mAOD), in the north eastern corner of the site. Within RO1 and RO1A, located within the north western part of the site, a zone of broken and soft ground was encountered at a depth of 5.00m to 9.00m bgl and 4.50m to 4.80m bgl, respectively. At the time of the investigation the cause of this anomaly was unknown.

- The coal seam was proven to be worked in one of the eight boreholes drilled. The 2014 investigation identified that potentially workable coal exists within influencing distance of the surface in the western part of the site. Elsewhere the coal should, even if worked, be too deep to affect surface stability.

3.0 Supplementary Ground Instigation

The fieldwork forming part of this supplementary mining investigation was carried out from 23rd to 28th April 2015 and comprised the drilling of 24 rotary openhole boreholes (RO8 to RO27 and RO9A to RO9D) to a maximum depth of 30.00m bgl.

The locations of the exploratory holes are shown on the Drawing No. C6138B/03, enclosed in Appendix A. Exploratory logs of the strata encountered at each probehole position are enclosed in

Appendix B.

4.0 Proven Ground Conditions

Rotary Probeholes

It should be noted that rotary open hole drilling techniques only recover small chip samples, brought to the surface by flush returns. Subsequently, the strata descriptions and depth to strata boundaries are based on field observations and are therefore limited and should be used as a guide only.

The depths of strata on the record sheets are recorded from current ground levels and Ordnance Datum at each location, unless indicated otherwise.

As detailed above the site is divided by an unnamed fault, orientated approximately north east/south west, within the north western part. The approximate conjectured alignment of the fault, based on proven ground conditions, is shown on the exploratory hole location plan, presented as Drawing No. C6138B/03 within Appendix A. For the purposes of this report the fault blocks are termed northern and southern, according to their approximate location beneath the site, and are discussed individually below.

Southern Fault Block

To the south of the fault, which includes the majority of the site, 15 of the supplementary rotary boreholes drilled identified a seam of intact coal at depths of between 6.80m and 25.10m bgl (approximately between 29.83m and 38.23m AOD), and was recorded to be between 0.1m and 1.20m thick (typically between 0.50m and 0.80m thick). This intact coal seam is considered to be representative of the Sharlston Low coal seam.

A thinner, lower leaf of coal was encountered between 0.50m and 1.40m below the base of the upper leaf within the majority of the probeholes, at depths of between 8.0m and 26.4m bgl (approximately between 28.02m and 35.74m AOD). This lower leaf of coal was recorded to be between 0.1m and 0.4m thick, resulting in a maximum recorded combined seam thickness of the Sharlston Low coal being 1.3m.

Evidence of potential mine workings, described as “broken ground/void”, were encountered within the Sharlston Low coal seam within six probeholes (RO9, RO9A to RO9D and RO21) drilled within the north western part of the site. The depths to the base of the potential workings were recorded to be between 10.60m and 18.10m bgl (approximately between 39.12m and 42.75m AOD). These depths were in general continuity with the depth at which the Sharlston Low coal seam was recorded elsewhere beneath the site.

Triangulation of the borehole data indicates the Sharlston Low coal seam to be dipping at between approximately 3.5° and 4° to the south east within the southern fault block.

Northern (Downthrow) Fault Block

Rotary probeholes RO10 and RO19 drilled as part of this supplementary ground investigation within the northern fault block identified one seam of intact coal at a depth of 25.10m and 26.00m bgl (approximately 31.30m and 31.61m AOD), respectively. This coal seam was recorded to be 1.3m and 1.2m thick, respectively. This coal seam is considered to be representative of the Sharlston Low coal seam

A 1.20m thick zone of “broken ground/void” was recorded within probehole RO8, drilled within the northern fault block, at a depth of 22.50m bgl (approximately 33.97m AOD). This zone corresponds with the depth at which the Sharlston Low coal seam was encountered within RO10 and RO19.

During the construction of RO8, drilling flush was lost within the solid strata directly overlying the zone of “broken ground/void”, between depths of 16.50m and 22.50m bgl (approximately 39.97m and 33.97m AOD). This loss of drilling flush is assumed to be associated with the solid strata being heavily fractured, potentially as a result of partial collapse of the underlying shallow mineworkings.

Triangulation of the borehole data indicates the Sharlston Low coal seam, within the northern fault block, to be dipping at approximately 5° to the south east.

5.0 Conclusions and Recommendations

It should be noted that the following conclusions and recommendations are based on the assumption that the site is to be developed for a low-rise (two storey) residential with gardens end-use (as shown on Drawing No. C6138B/02) and that development levels will be broadly as ground levels existed at the time of writing. It should be noted that since the production of this report the site boundary has been altered, however the overall conclusions and recommendations provided remain unaltered.

Rotary drilling undertaken as part of this supplementary investigation has identified evidence of mineworkings, considered to be representative of pillar and stall workings, within the Sharlston Low coal seam beneath the north western part of the site.

For typical Coal Measures strata it is generally accepted that there is a risk of surface instability where the thickness of competent bedrock above the worked coal seam is less than ten times the seam thickness. The maximum recorded intact thickness of the Sharlston Low coal seam during this and the 2014 investigation were recorded to be 1.30m. Using this recorded thickness and the superficial soils thickness at each individual borehole, it is considered that insufficient rock cover exists above the Sharlston Low coal seam within the far western part of the site i.e. in the vicinity of WS3, RO7, RO9, RO9A – RO9D, RO13 – RO16 and RO18.

Based on the proposed development layout it would appear that this area at risk from surface instability associated with shallow mineworkings (as annotated on Drawing No. C6138B/03, within Appendix A) is out-with any area of proposed structural development and is to be used as public open space (POS). On this basis it is considered that the risk associated with the identified mineworkings within this area is low and does not warrant remedial action. However, should the area of POS incorporate sizeable utilities (i.e. sewers) or drainage features (i.e. attenuation tanks) the shallow mineworkings may require treatment/consolidating.

Elsewhere on site, although evidence of potential workings were also encountered, based on the recorded thickness of the coal seam it is considered that sufficient rock cover exists above this seam to mitigate the risk of surface instability associated with unrecorded pillar and stall mineworkings.

The CA mining report records that no mine entries are known to exist on the site (although one is shown 20m to the south west), but warns of their potential unrecorded presence. It is therefore recommended that as part of the enabling works the site be stripped back to natural strata in order to inspect for mine entries / bell pits / crop workings. If evidence of a mine entry, bell pit,

coal workings or ground disturbance is suspected, advice regarding treatment / foundation precautions should be sought from a suitably qualified engineer.

At this stage a contingency should be included for treating yet unproven mine entries (i.e. shafts, adits and / or bell pits).

The recommendations presented above should be agreed with relevant regulators prior to works commencing on site.

Inspection of historical OS plans has revealed evidence of a former quarry / quarry high wall to the sites north western / western perimeter, in addition to a number of former sandstone quarries within the vicinity of the site. As such the possibility of encountering unrecorded quarries on site cannot be wholly discounted. It is recommended that all excavations be examined for evidence of such features. If evidence of an infilled quarry is suspected works should cease and the advice sought of a suitably qualified consultant.

With regards to the former quarry high wall located to the sites north western boundary it would be prudent to undertake a visual assessment of the rock face by a suitably qualified Engineer in order to ascertain the stability of the feature, particularly owing to the ground conditions identified i.e. broken ground/voids and the potential risk of impacting the development site, particularly if the proposed development is revised and residential properties are proposed in its proximity.

We trust the above is sufficient for your needs. If you require any further information regarding this investigation, however, please do not hesitate to contact us.

Yours sincerely



Mark Brennan
Associate

For and on behalf of Sirius Geotechnical & Environmental Ltd

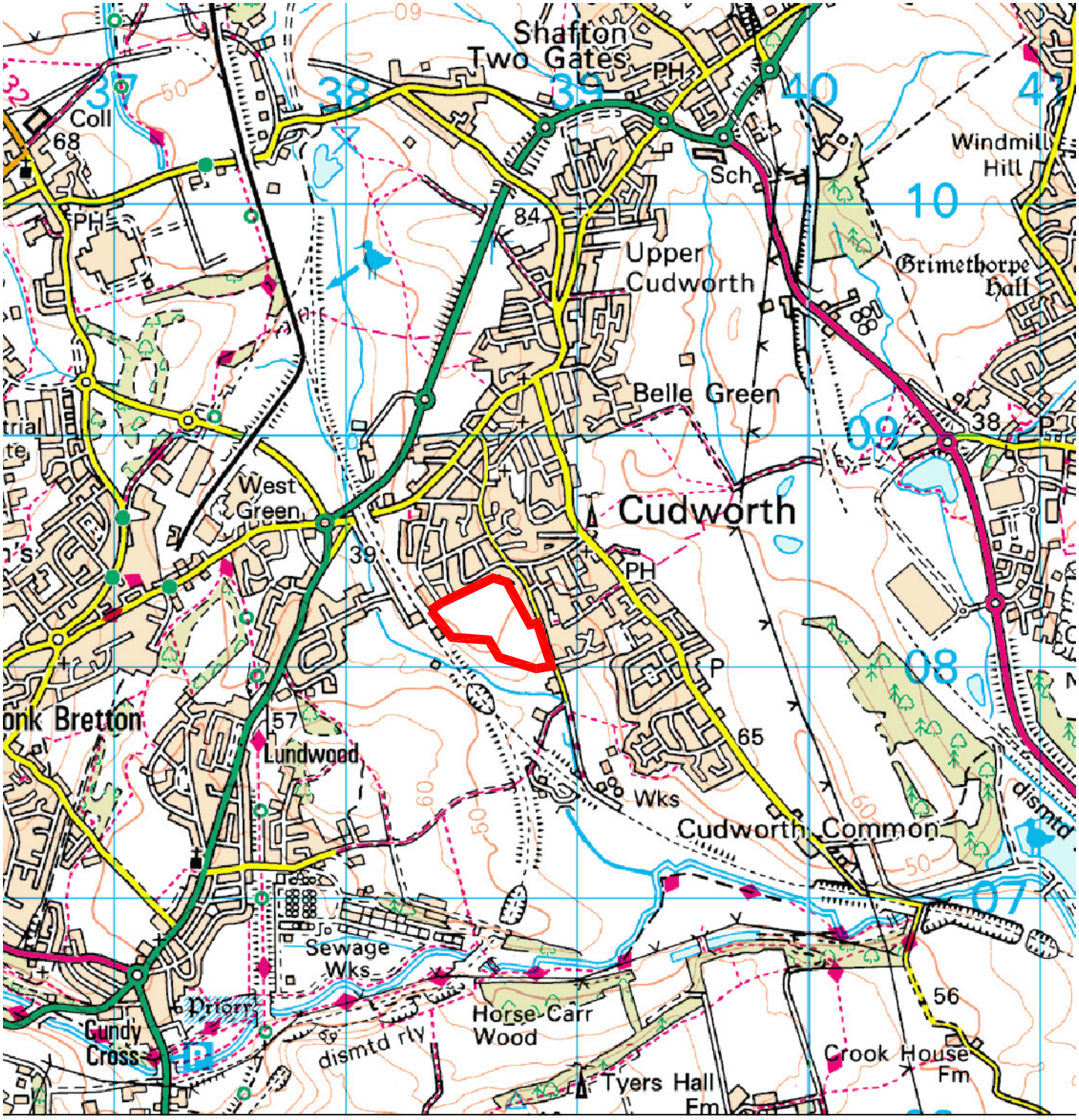
Encl:

Appendix A – Drawings:

- C6138B/01 Site Location Plan
- C6138B/02 Proposed Development Layout
- C6138B/03 Exploratory Hole Location Plan
- C6138B/04 Indicative Zone of Influence from Shallow Pillar and Stall Mineworkings

Appendix B – Exploratory Logs

Appendix A - Drawings



Reproduced from the Ordnance Survey 1:50,000 scale Landranger® map with the permission of The Controller of Her Majesty's Stationary Office, © Crown Copyright. All rights reserved.Sirius Geotechnical & Environmental Ltd, Suite 2, Russel House, Mill Road, Langley Moor, Durham DH7 8HJ. Licence No. 100042005

NOTES

Approximate Site Location

REVISION	
1	New Planning Layout
A	>>
B	>>
C	>>
D	>>

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CLIENT: Barratt & David Wilson Homes	DRAWING NO.: C6138B/01	REVISION NO.: 1	
SITE: Carrs Lane, Cudworth, Barnsley	DRAWN BY: DT	APPROVED BY: JL	
DRAWING TITLE: Site Location Plan	DATE: October 2015	SCALE: 1:25,000	A4

NOTES

Drawing reproduced from Urban Design's Proposed Site Layout - Ref. YW-04-03-Revision AA, dated 25th April 2017

REVISION

0	Updated development layout plan
A	Updated development layout plan
B	>>
C	>>
D	>>

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CLIENT

Barratt & David Wilson Homes

SITE

Carrs Lane,
Cudworth,
Barnsley

DRAWING TITLE

Proposed Development Layout Plan

DRAWING NO.	REVISION NO.
C6138B/02	B
DRAWN BY	**APPROVED BY**
MB	MB

DATE	SCALE	PAPER SIZE
April 2017	1:1,250	A2



NOTES

- Site Boundary
- Rotary Borehole (Sirius April 2015)
- Rotary Borehole (Sirius October 2014)
- Approximate Alignment of Sewer/Drain

REVISION

1	New Planning Layout
A	>>
B	>>
C	>>
D	>>

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CLIENT

Barratt & David Wilson Homes

SITE

Carrs Lane, Cudworth, Barnsley

DRAWING TITLE

Exploratory Hole Location Plan

DRAWING NO.	REVISION NO.
C6138B/03	1
DRAWN BY	APPROVED BY
GB	MB
DATE	SCALE	PAPER SIZE
October 2015	1:1,250	A2



NOTES

- Approximate Site Boundary
- Rotary Boreholes (Sirius October 2014)
- Rotary Boreholes (SIrius Aprll 2015)
- Zone at which Sharlston Low coal seam Is conjectured to be within influential depth of the surface

The above is based on the assumption that development levels will remain as exists at present

REVISION

1	New Planning Layout
A	>>
B	>>
C	>>
D	>>

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CLIENT

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SITE

Carrs Lane, Cudworth, Barnsley

DRAWING TITLE

Indicative Zone of Influence from Potential Shallow Pillar and Stall Mineworkings

DRAWING NO.	REVISION NO.
C6138B/04	1
DRAWN BY: JL	APPROVED BY: MB
DATE: October 2015	SCALE: 1:1500
PAPER SIZE: A2	



Appendix B – Exploratory Logs

BOREHOLE RECORD

BH No. **RO8**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138A

Client: Barratt & David Wilson Homes

Dates: 27/04/2015

Method: 12 tonne tracked rotary drilling rig

Scale 1:150

Logged By: GB | Checked By: MB

Driller: SDS

SAMPLE DETAILS						Groundwater (Casing)	STRATA RECORD				
Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	N (FI)		Description	Depth (m)	Level (mAOD)	Legend	Well
							MADE GROUND / TOPSOIL.	0.50	55.97		
							Brown weathered SANDSTONE.				
							Brown SANDSTONE.	6.00	50.47		
							Brown weathered SANDSTONE.	8.20	48.27		
							Brown SANDSTONE.	9.50	46.97		
							Brown weathered SANDSTONE.	12.50	43.97		
							Brown SANDSTONE.	15.00	41.47		
							Solid (No flush, no returns)	16.50	39.97		
							BROKEN GROUND / VOID (No flush, no returns).	22.50	33.97		
							Solid (No flush, no returns)	23.70	32.77		
							End of Borehole at 30.00 m				

Remarks and Water Observations

1. Water flush techniques used.
2. Hole backfilled with arisings and a bentonite seal.

GL (m AOD) 56.47
Easting: 438433.58
Northing: 408244.41

Fig. No. RO8

BOREHOLE RECORD

BH No. **RO9**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138A

Client: Barratt & David Wilson Homes

Dates: 23/04/2015

Method: 12 tonne tracked rotary drilling rig

Scale 1:150

Logged By: GB | Checked By: MB

Driller: SDS

SAMPLE DETAILS						Groundwater (Casing)	STRATA RECORD Description	Depth (m)	Level (mAOD)	Legend	Well
Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	N (FI)						
							MADE GROUND / TOPSOIL.	0.50	52.85		
							Brown weathered SANDSTONE.				
							Brown SANDSTONE.	9.80	43.55		
							BROKEN GROUND / VOID (No flush, no returns).	10.60	42.75		
							Brown SANDSTONE.	12.50	40.85		
							Grey MUDSTONE.	15.60	37.75		
							Interbedded MUDSTONE and SANDSTONE bands.	17.80	35.55		
							End of Borehole at 30.00 m				

Remarks and Water Observations

1. Water flush techniques used.
2. Hole backfilled with arisings and a bentonite seal.

GL (m AOD) 53.35
Easting: 438409.32
Northing: 408210.92

Fig. No. RO9

BOREHOLE RECORD

BH No. **RO9A**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138A

Client: Barratt & David Wilson Homes

Dates: 24/04/2015

Method: 12 tonne tracked rotary drilling rig

Scale 1:150

Logged By: GB | Checked By: MB

Driller: SDS

SAMPLE DETAILS

Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	N (FI)

STRATA RECORD

Groundwater (Casing)	Description	Depth (m)	Level (mAOD)	Legend	Well
	MADE GROUND / TOPSOIL.	0.50	53.10		
	Brown weathered SANDSTONE.				
	Brown SANDSTONE.	9.50	44.10		
	BROKEN GROUND / VOID (No flush, no returns).	12.00	41.60		
	Solid (No flush, no returns)	14.40	39.20		
	End of Borehole at 17.00 m	17.00	36.60		

Remarks and Water Observations

1. Water flush techniques used.
2. Hole backfilled with arisings and a bentonite seal.

GL (m AOD) 53.60
Easting: 438411.43
Northing: 408213.00

Fig. No. RO9A

BOREHOLE RECORD

BH No. **RO9B**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138A

Client: Barratt & David Wilson Homes

Dates: 24/04/2015

Method: 12 tonne tracked rotary drilling rig

Scale 1:150

Logged By: GB | Checked By: MB

Driller: SDS

SAMPLE DETAILS						Groundwater (Casing)	STRATA RECORD				
Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	N (FI)		Description	Depth (m)	Level (mAOD)	Legend	Well
							MADE GROUND / TOPSOIL.	0.50	52.46		
							Brown weathered SANDSTONE.				
							Brown SANDSTONE.	9.60	43.36		
							BROKEN GROUND / VOID (No flush, no returns).	11.00	41.96		
							Solid (No flush, no returns)	13.00	39.96		
							End of Borehole at 15.00 m	15.00	37.96		

Remarks and Water Observations

1. Water flush techniques used.
2. Hole backfilled with arisings and a bentonite seal.

GL (m AOD) 52.96
Easting: 438412.62
Northing: 408206.93

Fig. No. RO9B

BOREHOLE RECORD

BH No. **RO9C**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138A

Client: Barratt & David Wilson Homes

Dates: 24/04/2015

Method: 12 tonne tracked rotary drilling rig

Scale 1:150

Logged By: GB | Checked By: MB

Driller: SDS

SAMPLE DETAILS						Groundwater (Casing)	STRATA RECORD				
Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	N (FI)		Description	Depth (m)	Level (mAOD)	Legend	Well
							MADE GROUND / TOPSOIL.	0.50	52.06		
							Brown weathered SANDSTONE.				
							Brown SANDSTONE.	9.30	43.26		
							BROKEN GROUND / VOID (No flush, no returns).	12.00	40.56		
							Solid (No flush, no returns)	13.50	39.06		
							End of Borehole at 17.00 m	17.00	35.56		

Remarks and Water Observations

1. Water flush techniques used.
2. Hole backfilled with arisings and a bentonite seal.

GL (m AOD) 52.56
Easting: 438404.08
Northing: 408206.46

Fig. No. RO9C

BOREHOLE RECORD

BH No. **RO9D**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138A

Client: Barratt & David Wilson Homes

Dates: 24/04/2015

Method: 12 tonne tracked rotary drilling rig

Scale 1:150

Logged By: GB | Checked By: MB

Driller: SDS

SAMPLE DETAILS

Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	N (FI)

Groundwater (Casing)

STRATA RECORD

Description	Depth (m)	Level (mAOD)
MADE GROUND / TOPSOIL.	0.50	53.50
Brown weathered SANDSTONE.		
Brown SANDSTONE.	6.20	47.80
BROKEN GROUND / VOID (No flush, no returns).	14.10	39.90
Solid (No flush, no returns)	15.70	38.30
End of Borehole at 18.00 m	18.00	36.00

Legend

Well

Remarks and Water Observations

1. Water flush techniques used.
2. Hole backfilled with arisings and a bentonite seal.

GL (m AOD) 54.00
Easting: 438403.91
Northing: 408219.58

Fig. No. RO9D

BOREHOLE RECORD

BH No. **RO10**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138A

Client: Barratt & David Wilson Homes

Dates: 27/04/2015

Method: 12 tonne tracked rotary drilling rig

Scale 1:150

Logged By: GB | Checked By: MB

Driller: SDS

SAMPLE DETAILS

Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	N (FI)

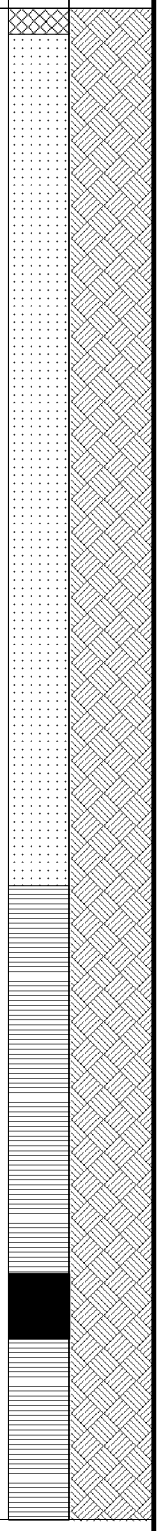
Groundwater (Casing)

STRATA RECORD

Depth (m)	Level (mAOD)	Description
0.50	56.74	MADE GROUND / TOPSOIL.
		Brown SANDSTONE.
17.40	39.84	Grey MUDSTONE.
25.10	32.14	Black COAL.
26.40	30.84	Grey MUDSTONE.

End of Borehole at 30.00 m

Legend / Well



Remarks and Water Observations

1. Water flush techniques used
.2. Hole backfilled with arisings and a bentonite seal.

GL (m AOD) 57.24
Easting: 438454.88
Northing: 408256.86

Fig. No. RO10

BOREHOLE RECORD

BH No. **RO11**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138A

Client: Barratt & David Wilson Homes

Dates: 23/04/2015

Method: 12 tonne tracked rotary drilling rig

Scale 1:150

Logged By: GB | Checked By: MB

Driller: SDS

SAMPLE DETAILS

Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	N (FI)

Groundwater (Casing)

STRATA RECORD

Description	Depth (m)	Level (mAOD)
MADE GROUND / TOPSOIL.	0.50	45.12
Brown weathered SANDSTONE.		
Fractured SANDSTONE (no flush, no returns).	7.30	38.32
Brown SANDSTONE.	9.00	36.62
Grey MUDSTONE.	15.10	30.52
Black COAL.	15.40	30.22
Grey MUDSTONE.	16.20	29.42
Black COAL.	17.60	28.02
Grey MUDSTONE.	18.00	27.62
End of Borehole at 19.00 m	19.00	26.62

Legend

Well

Remarks and Water Observations

1. Groundwater not encountered.
2. Air flush techniques used.3. Hole backfilled with arisings and a bentonite seal.

GL (m AOD) 45.62
Easting: 438509.26
Northing: 408066.77

Fig. No. RO11

BOREHOLE RECORD

BH No. **RO12**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138A

Client: Barratt & David Wilson Homes

Dates: 24/04/2015

Method: 12 tonne tracked rotary drilling rig

Scale 1:150

Logged By: GB | Checked By: MB

Driller: SDS

SAMPLE DETAILS						Groundwater (Casing)	STRATA RECORD				
Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	N (FI)		Description	Depth (m)	Level (mAOD)	Legend	Well
							MADE GROUND / TOPSOIL.	0.30	49.13		
							Brown SANDSTONE.				
							Brown weathered SANDSTONE.	6.30	43.13		
							Brown SANDSTONE.	7.20	42.23		
							Grey MUDSTONE.	18.50	30.93		
							Black COAL.	19.60	29.83		
							Grey MUDSTONE.	19.70	29.73		
							Black COAL.	20.40	29.03		
							Interbedded MUDSTONE and SANDSTONE bands.	20.50	28.93		
							End of Borehole at 30.00 m				

Remarks and Water Observations

1. Groundwater encountered at 21.0m bgl.
2. Air flush techniques used.
3. Hole backfilled with arisings and a bentonite seal.

GL (m AOD) 49.43
Easting: 438527.10
Northing: 408074.67

Fig. No. RO12

BOREHOLE RECORD

BH No. **RO13**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138A

Client: Barratt & David Wilson Homes

Dates: 23/04/2015

Method: 12 tonne tracked rotary drilling rig

Scale 1:150

Logged By: GB | Checked By: MB

Driller: SDS

SAMPLE DETAILS						Groundwater (Casing)	STRATA RECORD				
Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	N (FI)		Description	Depth (m)	Level (mAOD)	Legend	Well
							MADE GROUND / TOPSOIL.	0.50	43.95		
							Brown weathered SANDSTONE.				
								2.50	41.95		
							Brown SANDSTONE.	3.00	41.45		
							Brown weathered SANDSTONE (No flush, no returns).				
								4.40	40.05		
							Brown SANDSTONE.				
								6.80	37.65		
							Brown weathered SANDSTONE (no flush, no returns).				
								9.00	35.45		
							Brown SANDSTONE.				
								10.70	33.75		
							Grey MUDSTONE.	11.60	32.85		
							Black COAL.	12.10	32.35		
							Grey MUDSTONE.				
						▽		13.80	30.65		
							Grey MUDSTONE.				
								15.00	29.45		
							Interbedded MUDSTONE and SANDSTONE bands.				
								24.00	20.45		
							End of Borehole at 24.00 m				

Remarks and Water Observations

1. Groundwater encountered at 14.0m bgl.
2. Air flush techniques used.
3. Hole backfilled with arisings and a bentonite seal.

GL (m AOD)
44.45
Easting:
438470.71
Northing:
408470.71

Fig. No.
RO13

BOREHOLE RECORD

BH No. **RO14**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138A

Client: Barratt & David Wilson Homes

Dates: 24/04/2015

Method: 12 tonne tracked rotary drilling rig

Scale 1:150

Logged By: GB | Checked By: MB

Driller: SDS

SAMPLE DETAILS

Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	N (FI)

STRATA RECORD

Groundwater (Casing)	Description	Depth (m)	Level (mAOD)	Legend	Well
	MADE GROUND / TOPSOIL.	0.50	46.53		
	Brown weathered SANDSTONE.				
	Fractured SANDSTONE (no flush, no returns).	4.50	42.53		
	Brown SANDSTONE.	6.00	41.03		
	Black COAL.	13.50	33.53		
	Grey MUDSTONE.	14.20	32.83		
	Black COAL.	15.00	32.03		
	Grey MUDSTONE.	15.20	31.83		
▽ 18					
	End of Borehole at 24.00 m	24.00	23.03		

Remarks and Water Observations

1. Groundwater encountered at 18.0m bgl.
2. Air flush techniques used.
3. Hole backfilled with arisings and a bentonite seal.

GL (m AOD) 47.03
Easting: 438467.45
Northing: 408119.98

Fig. No. RO14

BOREHOLE RECORD

BH No. **RO15**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138A

Client: Barratt & David Wilson Homes

Dates: 24/04/2015

Method: 12 tonne tracked rotary drilling rig

Scale 1:150

Logged By: | Checked By: MB

Driller: SDS

SAMPLE DETAILS

Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	N (FI)

STRATA RECORD

Groundwater (Casing)	Description	Depth (m)	Level (mAOD)	Legend	Well
	MADE GROUND / TOPSOIL.	0.50	43.23		
	Brown weathered SANDSTONE.				
	Black COAL.	6.80	36.93		
		7.00	36.73		
	Grey MUDSTONE.				
		8.00	35.73		
	Black COAL.	8.10	35.63		
	Brown SANDSTONE.				
	Grey MUDSTONE.	13.60	30.13		
	End of Borehole at 18.00 m	18.00	25.73		

Remarks and Water Observations

1. Groundwater not encountered.
2. Air flush techniques used.
3. Hole backfilled with arisings and a bentonite seal.

GL (m AOD)
43.73
Easting:
438426.75
Northing:
408131.38

Fig. No.
RO15

BOREHOLE RECORD

BH No. **RO16**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138A

Client: Barratt & David Wilson Homes

Dates: 24/04/2015

Method: 12 tonne tracked rotary drilling rig

Scale 1:150

Logged By: GB | Checked By: MB

Driller: SDS

SAMPLE DETAILS						Groundwater (Casing)	STRATA RECORD Description	Depth (m)	Level (mAOD)	Legend	Well
Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	N (FI)						
							MADE GROUND / TOPSOIL.	0.50	47.97		
							Brown weathered SANDSTONE.				
							Brown SANDSTONE.	6.00	42.47		
							Fractured SANDSTONE (no flush, no returns).	8.00	40.47		
							Brown SANDSTONE.	10.00	38.47		
							Fractured SANDSTONE (no flush, no returns).	10.70	37.77		
							Brown SANDSTONE.	12.00	36.47		
							Black COAL.	12.20	36.27		
							Grey MUDSTONE.	12.90	35.57		
							Black COAL.	13.50	34.97		
							Grey MUDSTONE.	13.60	34.87		
							End of Borehole at 18.00 m	18.00	30.47		

Remarks and Water Observations

1. Groundwater not encountered.
2. Air flush techniques used.
3. Hole backfilled with arisings and a bentonite seal.

GL (m AOD)
48.47
Easting:
438440.43
Northing:
408157.95

Fig. No.
RO16

BOREHOLE RECORD

BH No. **RO17**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138A

Client: Barratt & David Wilson Homes

Dates: 24/04/2015

Method: 12 tonne tracked rotary drilling rig

Scale 1:150

Logged By: GB | Checked By: MB

Driller: SDS

SAMPLE DETAILS

Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	N (FI)

STRATA RECORD

Groundwater (Casing)	Description	Depth (m)	Level (mAOD)	Legend	Well
	MADE GROUND / TOPSOIL.	0.30	53.43		
	Brown weathered SANDSTONE.				
	Brown SANDSTONE.	2.60	51.13		
	Black COAL.	15.50	38.23		
	Grey MUDSTONE.	16.30	37.43		
	End of Borehole at 24.00 m	24.00	29.73		

Remarks and Water Observations

1. Groundwater not encountered.
2. Air flush techniques used.
3. Hole backfilled with arisings and a bentonite seal.

GL (m AOD) 53.73
Easting: 438439.26
Northing: 408206.99

Fig. No. RO17

BOREHOLE RECORD

BH No. **RO18**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138A

Client: Barratt & David Wilson Homes

Dates: 23/04/2015

Method: 12 tonne tracked rotary drilling rig

Scale 1:150

Logged By: GB | Checked By: MB

Driller: SDS

SAMPLE DETAILS

Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	N (FI)

Groundwater (Casing)

STRATA RECORD

Description	Depth (m)	Level (mAOD)
MADE GROUND / TOPSOIL.	0.50	40.52
Brown weathered SANDSTONE.		
Brown SANDSTONE.	2.80	38.22
Grey MUDSTONE.	8.70	32.32
Black COAL.	10.00	31.02
Grey MUDSTONE.	11.00	30.02
Black COAL.	12.20 12.50	28.82 28.52
Grey MUDSTONE.		
End of Borehole at 15.00 m	15.00	26.02

Legend

Well

Remarks and Water Observations

1. Groundwater encountered at 10.0m bgl.
2. Air flush techniques used.
3. Hole backfilled with arisings and a bentonite seal.

GL (m AOD)
41.02
Easting:
438488.47
Northing:
408056.95

Fig. No.
RO18

BOREHOLE RECORD

BH No. **RO19**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138A

Client: Barratt & David Wilson Homes

Dates: 27/04/2015

Method: 12 tonne tracked rotary drilling rig

Scale 1:150

Logged By: GB | Checked By: MB

Driller: SDS

SAMPLE DETAILS

Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	N (FI)

Groundwater (Casing)

STRATA RECORD

Description	Depth (m)	Level (mAOD)
MADE GROUND / TOPSOIL.	0.50	57.12
Brown SANDSTONE.		
Fractured SANDSTONE (no flush, no returns).	13.80	43.82
Brown SANDSTONE.	15.00	42.62
Grey MUDSTONE.	19.20	38.42
Brown SANDSTONE.	23.50	34.12
Black COAL.	26.00	31.62
Grey MUDSTONE.	27.20	30.42

Legend | Well

End of Borehole at 30.00 m

Remarks and Water Observations

1. Water flush techniques used.
2. Hole backfilled with arisings and a bentonite seal.

GL (m AOD) 57.62
Easting: 438471.34
Northing: 408272.35

Fig. No. RO19

BOREHOLE RECORD

BH No. **RO20**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138A

Client: Barratt & David Wilson Homes

Dates: 27/04/2015

Method: 12 tonne tracked rotary drilling rig

Scale 1:150

Logged By: GB | Checked By: MB

Driller: SDS

SAMPLE DETAILS

Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	N (FI)

STRATA RECORD

Groundwater (Casing)	Description	Depth (m)	Level (mAOD)	Legend	Well
	MADE GROUND / TOPSOIL.	0.50	55.04		
	Brown SANDSTONE.				
	Brown weathered SANDSTONE.	15.80	39.74		
	Brown SANDSTONE.	17.20	38.34		
	Black MUDSTONE.	18.00	37.54		
	Grey MUDSTONE	19.20	36.34		
	End of Borehole at 21.00 m	21.00	34.54		

Remarks and Water Observations

1. Water flush techniques used.
2. Hole backfilled with arisings and a bentonite seal.

GL (m AOD) 55.54
Easting: 438437.84
Northing: 408227.99

Fig. No. RO20

BOREHOLE RECORD

BH No. **RO21**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138A

Client: Barratt & David Wilson Homes

Dates: 28/04/2015

Method: 12 tonne tracked rotary drilling rig

Scale 1:150

Logged By: GB | Checked By: MB

Driller: SDS

SAMPLE DETAILS						Groundwater (Casing)	STRATA RECORD Description	Depth (m)	Level (mAOD)	Legend	Well
Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	N (FI)						
							MADE GROUND / TOPSOIL.	0.50	56.72		
							Brown SANDSTONE.				
							Brown weathered SANDSTONE.	6.30	50.92		
							Brown SANDSTONE.	12.00	45.22		
							Grey MUDSTONE.	16.00	41.22		
							BROKEN GROUND / VOID (No flush, no returns).	18.10	39.12		
							Solid (No flush, no returns)	19.60	37.62		
							End of Borehole at 24.00 m	24.00	33.22		

Remarks and Water Observations

1. Water flush techniques used.
2. Hole backfilled with arisings and a bentonite seal.

GL (m AOD) 57.22
Easting: 438467.58
Northing: 408245.18

Fig. No. RO21

BOREHOLE RECORD

BH No. **RO22**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138A

Client: Barratt & David Wilson Homes

Dates: 28/04/2015

Method: 12 tonne tracked rotary drilling rig

Scale 1:150

Logged By: GB | Checked By: MB

Driller: SDS

SAMPLE DETAILS						Groundwater (Casing)	STRATA RECORD Description	Depth (m)	Level (mAOD)	Legend	Well
Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	N (FI)						
							MADE GROUND / TOPSOIL.	0.50	57.51		
							Brown SANDSTONE.				
							Brown weathered SANDSTONE.	6.00	52.01		
							Brown SANDSTONE.	11.50	46.51		
							Grey MUDSTONE.	17.00	41.01		
							Black COAL.	24.30	33.71		
							Grey MUDSTONE.	24.70	33.31		

End of Borehole at 30.00 m

Remarks and Water Observations

1. Water flush techniques used.
2. Hole backfilled with arisings and a bentonite seal.

GL (m AOD) 58.01
Easting: 438489.50
Northing: 408255.98

Fig. No. RO22

BOREHOLE RECORD

BH No. **RO23**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138A

Client: Barratt & David Wilson Homes

Dates: 28/04/2015

Method: 12 tonne tracked rotary drilling rig

Scale 1:150

Logged By: GB | Checked By: MB

Driller: SDS

SAMPLE DETAILS

Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	N (FI)

STRATA RECORD

Groundwater (Casing)	Description	Depth (m)	Level (mAOD)	Legend	Well
	MADE GROUND / TOPSOIL.	0.50	54.54		
	Brown SANDSTONE.				
	Black COAL.	17.80	37.24		
	Grey MUDSTONE.	18.70	36.34		
	Black COAL.	19.30	35.74		
	Grey MUDSTONE.	19.50	35.54		
	End of Borehole at 24.00 m	24.00	31.04		

Remarks and Water Observations

1. Groundwater not encountered.
2. Air flush techniques used.
3. Hole backfilled with arisings and a bentonite seal.

GL (m AOD) 55.04
Easting: 438454.88
Northing: 408214.40

Fig. No. RO23

BOREHOLE RECORD

BH No. **RO24**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138A

Client: Barratt & David Wilson Homes

Dates: 28/04/2015

Method: 12 tonne tracked rotary drilling rig

Scale 1:150

Logged By: GB | Checked By: MB

Driller: SDS

SAMPLE DETAILS

Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	N (FI)

Groundwater (Casing)

STRATA RECORD

Description	Depth (m)	Level (mAOD)
MADE GROUND / TOPSOIL.	0.50	53.47
Brown SANDSTONE.		
Black COAL.	18.20	35.77
Grey MUDSTONE.	19.00	34.97
Black COAL.	19.80	34.17
Grey MUDSTONE.	20.00	33.97
End of Borehole at 24.00 m	24.00	29.97

Legend

Well

Remarks and Water Observations

1. Groundwater not encountered.
2. Air flush techniques used.
3. Hole backfilled with arisings and a bentonite seal.

GL (m AOD) 53.97
Easting: 438465.73
Northing: 408193.06

Fig. No. RO24

BOREHOLE RECORD

BH No. **RO25**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138A

Client: Barratt & David Wilson Homes

Dates: 28/04/2015

Method: 12 tonne tracked rotary drilling rig

Scale 1:150

Logged By: GB | Checked By: MB

Driller: SDS

SAMPLE DETAILS						Groundwater (Casing)	STRATA RECORD				
Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	N (FI)		Description	Depth (m)	Level (mAOD)	Legend	Well
							MADE GROUND / TOPSOIL.	0.50	53.08		
							Brown SANDSTONE.				
							Grey MUDSTONE.	20.20	33.38		
							Black COAL.	21.00	32.58		
							Grey MUDSTONE.	21.80	31.78		
							Black COAL.	22.50	31.08		
							Grey MUDSTONE.	22.70	30.88		
							End of Borehole at 25.00 m	25.00	28.58		

Remarks and Water Observations

1. Groundwater not encountered.
2. Air flush techniques used.
3. Hole backfilled with arisings and a bentonite seal.

GL (m AOD) 53.58
Easting: 438488.19
Northing: 408165.43

Fig. No. RO25

BOREHOLE RECORD

BH No. **RO26**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138A

Client: Barratt & David Wilson Homes

Dates: 28/04/2015

Method: 12 tonne tracked rotary drilling rig

Scale 1:150

Logged By: GB | Checked By: MB

Driller: SDS

SAMPLE DETAILS

Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	N (FI)

Groundwater (Casing)

STRATA RECORD

Description	Depth (m)	Level (mAOD)
MADE GROUND / TOPSOIL.	0.50	57.95
Brown SANDSTONE.		
Interbedded MUDSTONE and SANDSTONE bands.	19.30	39.15
Black COAL.	25.10	33.35
Grey MUDSTONE.	25.90	32.55
	26.40	32.05
Black COAL.	26.60	31.85
Grey MUDSTONE.		

Legend

Well

End of Borehole at 30.00 m

Remarks and Water Observations

1. Groundwater not encountered.2. Air flush techniques used.3. Hole backfilled with arisings and a bentonite seal.

GL (m AOD) 58.45
Easting: 438513.34
Northing: 408242.63

Fig. No. RO26

BOREHOLE RECORD

BH No. **RO27**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138A

Client: Barratt & David Wilson Homes

Dates: 28/04/2015

Method: 12 tonne tracked rotary drilling rig

Scale 1:150

Logged By: GB | Checked By: MB

Driller: SDS

SAMPLE DETAILS

Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	N (FI)

Groundwater (Casing)

STRATA RECORD

Depth (m)	Level (mAOD)	Description
0.00	56.38	MADE GROUND / TOPSOIL.
0.50	56.38	Brown SANDSTONE.
21.80	35.08	Black COAL.
22.60	34.28	Grey MUDSTONE.
23.20	33.68	Black COAL.
23.40	33.48	Grey MUDSTONE.
26.00	30.88	End of Borehole at 26.00 m

Legend

Well

Remarks and Water Observations

1. Groundwater not encountered.
2. Air flush techniques used.
3. Hole backfilled with arisings and a bentonite seal.

GL (m AOD) 56.88
Easting: 438483.12
Northing: 408228.50

Fig. No. RO27