

**PHASE 2 ENGINEERING & ENVIRONMENTAL
ASSESSMENT
FOR A PROPOSED EXTENSION AND WASTE
TRANSFER STATION AT
BARR STREET, HUDDERSFIELD**

CONTENTS

- 1.0 INTRODUCTION
- 2.0 LOCATION, TOPOGRAPHY & CURRENT CONDITION
- 3.0 GROUND INVESTIGATION
- 4.0 CONTAMINATION – DESIGN OBJECTIVES & PHILOSOPHY
- 5.0 DISCUSSION
- 6.0 CONTAMINATION ASSESSMENT
- 7.0 RECLAMATION PROPOSALS
- 8.0 SUMMARY
- 9.0 CAVEATS

APPENDICES

- APPENDIX A - LIST OF DOCUMENTS REFERRED TO
- APPENDIX B - SITE LOCATION PLAN – FIG. 1
- APPENDIX C - SITE PLAN AND SITE TOPOGRAPHICAL SURVEY - FIG. 2
- APPENDIX D - SITE AERIAL PHOTOGRAPH
- APPENDIX E - TRIAL PIT LOGS
- APPENDIX F - CABLE PERCUSSION & ROTARY BOREHOLE LOGS
- APPENDIX G - CHEMICAL TEST RESULTS
- APPENDIX H - GEOTECHNICAL TEST RESULTS
- APPENDIX I - CONTAMINATION ASSESSMENT CRITERIA FOR COMMERCIAL USE

1.0 INTRODUCTION

- 1.01 Following instructions from R. N. Wooler & Co Ltd during August 2019, CoDA Structures have undertaken an appraisal of a transfer station at Barr Street, Huddersfield. The appraisal assesses both engineering and environmental issues.
- 1.02 The site is part of the Myers Group, a builder's merchant.
- 1.03 It is proposed to extend an existing building to provide additional warehousing and construct a waste transfer building.
- 1.04 A Preliminary Site Assessment and Coal Mining Risk Assessment report (Ref: 07031-CUR-XX-RP-GE-001) has been prepared for the site by Curtains. This report has been used for background information.
- 1.05 A trial pit investigation was undertaken on the site on 25 July 2019.
- 1.06 A borehole investigation was undertaken on the site on 25 July 2019, between 20 and 23 August 2019, and 27 and 28 August 2019.
- 1.07 The local authority is Kirklees Council (KC).

2.0 LOCATION, TOPOGRAPHY & CURRENT CONDITION

- 2.01 The site is located to the west of Leeds Road and lies approximately 1.5 miles to the northeast of Huddersfield town centre. A site location plan (Fig. 1) is attached in Appendix B.
- 2.02 The Ordnance Survey co-ordinates for the centre of the site are 415270 mE, 418080 mN.
- 2.03 The facility occupies approximately 3.5 hectares.
- 2.04 The site can be accessed from Barr Street.
- 2.05 The site is currently used as a builder's merchant. The areas of the proposed extension and new building are part of external concrete storage yards.
- 2.06 A site plan and a topographical survey of the areas of the proposed extension and new building (Fig 2) are attached in Appendix C.
- 2.07 A site aerial photograph is attached in Appendix D.

3.0 GROUND INVESTIGATION

3.01 Fieldwork:

6 No. trial pits were excavated to depths of between 1.95m and 2.40m using a mechanical excavator on 25th July 2019. The purpose of the trial pits was to allow an insitu visual inspection of the superficial soils, recover samples for laboratory testing and undertake insitu testing.

1 No. rotary borehole was drilled to a depth of 24.0m using a tracked rig on 25th July 2019. The purpose of the borehole was to investigate the possible presence of shallow coal seams/workings below the site.

5 No. cable percussion boreholes were drilled to depths of between 7.42 and 9.05m between 20 and 28 August 2019. The purpose of the boreholes was to allow an insitu visual inspection of the superficial soils, recover samples for laboratory testing and undertake insitu testing.

2 No. rotary follow-on boreholes were drilled to a depth of 30m in boreholes BH2 and BH4. The purpose of the boreholes was to investigate the possible presence of shallow coal seams/workings below the site.

The location of the trial pits, cable percussion boreholes and rotary boreholes are indicated on the Site Topographical Survey (Fig. 2) attached in Appendix C.

3.02 Laboratory Testing:

To provide an assessment of soil contamination with respect to the proposed residential development soil samples were screened for a range of potential contaminants. The screening included the following:-

Arsenic	Mercury	Zinc	PAH (16EPA)	Phenols
Cadmium	Selenium	Boron (ws)	TPH (speciated)	
Chromium	Copper	Sulphate (ws)	Asbestos	
Lead	Nickel	pH	Sulphate	

In view of the ground conditions encountered no geotechnical testing was undertaken.

3.03 Ground Conditions:

The following ground conditions were encountered in the window sampling borehole investigation:-

Strata	Location					
	TP1	TP2	TP3	TP4	TP5	TP6
Approx. Ground Level (metres)	58.30	58.40	58.45	58.30	58.45	58.40
Concrete slab	0.19m	0.17m	0.22m	0.17,	0.15m	0.20m
Made Ground	0.19 - 0.85m	0.17 - 0.50m	0.22 - 0.50m	0.17 - 0.45m	0.15 - 0.55m	0.20 - 1.8m
Silt	0.85 - 1.05m	-	-	-	-	-

Clay	1.05 - 1.50m (firm, medium strength) 1.50 - 2.10m (soft, low strength)	0.50 - 0.70m (soft, low strength) 0.7 - 1.60m (b)	0.50 - 2.20m (soft, low strength)	0.45 - 1.60m (soft, low strength)	0.55 - 0.75m 0.75 - 2.00m (soft, low strength)	
Sand	2.10 - 2.35m	1.60 - 2.20m	2.20 - 2.40m	1.60 - 2.30m	2.00 - 2.40m	1.80 - 1.95m
Stability	(Continuous collapse of pit walls at 2.30m)	Continuous collapse of pit walls at 2.20m	(Continuous collapse of pit walls at 2.30m)	(Continuous collapse of pit walls at 2.30m)	(Continuous collapse of pit walls at 2.30m)	(Continuous collapse of pit walls at 2.30m)

A concrete slab between 0.15 and 0.22m thick was encountered in all the trial pits. Made ground was encountered in all the trial pits and varied in thickness between 0.45 and 1.80m. The made ground encountered generally comprised of stone, gravel, grit and sand.

The full description of the strata encountered is recorded on the trial pit logs attached in Appendix E.

The following ground conditions were encountered in the Cable Percussion and Rotary Borehole investigation:-

Borehole BH1	
Strata	Thickness (m)
Concrete	0.30
Made Ground	1.70
Medium Gravel	1.10
Dense Gravel	5.30
Mudstone	0.72

Borehole BH2/R2	
Strata	Thickness (m)
Concrete	0.30
Made Ground	1.60
Medium Dense Gravel	1.50
Very Dense Gravel	0.80
Stiff Clay	0.30
Dense Gravel	1.80
Medium Dense Gravel	2.20
Mudstone	4.80
Siltstone	6.10
Mudstone	4.60
Siltstone	6.00

Borehole R3	
Strata	Thickness (m)
Concrete	0.25
Made Ground	0.55
Soft Clay	0.70
Sand	0.50
Sand & Gravel	6.20

Shale	1.30
Mudstone	1.00
Coal	0.50
Siltstone	8.30
Shale	1.10
Mudstone	3.60

Borehole BH4/R4	
Strata	Thickness (m)
Concrete	0.30
Made Ground	1.70
Soft Clay	0.80
Dense Gravel	0.40
Clay	0.80
Medium Dense Gravel	0.90
Stiff Clay	1.10
Mudstone	2.80
Coal	0.50
Siltstone	6.70
Mudstone	5.00
Coal	0.30
Mudstone	0.30
Siltstone	5.50
Mudstone	1.90

Borehole BH5	
Strata	Thickness (m)
Concrete	0.30
Made Ground	1.70
Soft clay	1.80
Dense Gravel	4.60
Mudstone	0.62

Borehole BH6	
Strata	Thickness (m)
Concrete	0.30
Made Ground	1.70
Very soft clay	0.80
Medium Gravel	3.20
Firm clay	0.60
Medium dense Gravel	1.20
Mudstone	1.25

The full description of the strata encountered is recorded on the cable percussion and rotary borehole logs attached in Appendix F.

3.04 Groundwater:

The following groundwater conditions were encountered in the trial pit borehole investigation:-

Strata	Location					
	TP1	TP2	TP3	TP4	TP5	TP6
Approx. Ground Level (m AOD)	58.30	58.40	58.45	58.30	58.45	58.40
Groundwater	Moderate flow at 2.30m	Moderate flow at 2.20m	Moderate flow at 2.30m	Moderate flow at 2.25m	Moderate flow at 2.30m	Moderate flow at 1.95m

Groundwater was encountered in the borehole investigation as follows:-

- BH1 – inflow at 1.90m begl rising to 1.60m begl in 20 minutes.
- BH2 – inflow at 1.90m begl rising to 1.60m begl in 20 minutes.
- BH2 – inflow at 3.40m begl rising to 1.50m begl in 20 minutes.
- R2 – fast inflow at 24.00m begl rising to 1.10m begl in 20 minutes.
- R3 – medium inflow at 2.00m.
- BH4 – inflow at 2.80m begl rising to 3.20m begl in 20 minutes.
- BH4 – inflow at 4.00m begl rising to 2.30m begl in 20 minutes.
- R4 – fast inflow at 9.60m begl rising to 1.75m begl in 20 minutes.
- BH5 – inflow at 3.80m begl rising to 1.60m begl in 20 minutes.
- BH6 – inflow at 2.80m begl rising to 2.40m begl in 20 minutes.
- BH6 – inflow at 5.00m begl rising to 1.90m begl in 20 minutes.
- BH6 – inflow at 6.60m begl rising to 1.50m begl in 20 minutes.

Groundwater levels measured during the gas monitoring period are indicated in the following table:-

Borehole	Date			
	28.08.19	19.09.19	01.11.19	15.11.19
BH2/R2	1.60m	1.70m	1.60m	1.40m
R3	1.80m	1.70m	1.60m	1.40m
BH4/R4	2.00m	*	*	0.80m
BH5	1.90m	1.80m	1.70m	1.50m

* well not accessible

3.05 Excavations:

Due to the type of investigation undertaken no visual comment on excavation stability can be made.

3.06 Laboratory Testing:**Soils**

The results of the chemical analyses on the soil samples are summarised below.

Chemical Test result certificates are attached in Volume 2, Appendix I.

Samples taken from the made ground (TP1, TP4, TP6, BH1, BH2, BH4, BH5 and BH6):

Contaminant	Concentration in soils mg/kg*	Number of samples tested
Arsenic	7.0 – 45.0	10
Cadmium	0.22 – 1.0	10
Chromium	15.0 – 50.0	10
Lead	17.0 – 310	10
Mercury	<0.1 – <1.0	10
Selenium	<0.2 – <3.0	10
Copper	12.0 – 100	10
Nickel	14.0 – 49.0	10
Zinc	44.0 - 290	10
Boron (water soluble)	0.46 – 1.2	10
Sulphate (water soluble)	<0.07 – 0.89 g/l	10
pH	6.4 – 11.2	10
Phenols	<0.3 – 1.3	10
Asbestos	Detected/Not Detected	8
PAH	4.4 – 430	10

* unless noted otherwise.

The results of a sulphate and pH determinations indicate sulphate content expressed as 2:1 aqueous extract of between <0.07 – 0.89 g/l SO₄ with pH values between 6.4 and 11.2.

Samples taken from the natural ground (TP1 and TP6):-

Contaminant	Concentration in soils mg/kg*	Number of samples tested
Arsenic	7.0 – 34.0	2
Cadmium	<1.0 – 1.0	2
Chromium	28.0 – 51.0	2
Lead	75.0 – 410	2
Mercury	<1.0	2
Selenium	<3.0	2
Copper	24.0 – 140	2
Nickel	26.0 – 37.0	2
Zinc	120 – 320	2
Boron (water soluble)	<1.0	2
Sulphate (water soluble)	0.03 – 0.35 g/l	14
pH	3.6 – 8.4	14
Phenols	<1.0	2
PAH	2.7 – 13.0	2

* unless noted otherwise.

The results of sulphate and pH determinations indicate sulphate content expressed as 2:1 aqueous extract of <0.1 g/l SO₄ with pH values between 3.6 and 8.4.

3.07 Insitu Testing:

The results of hand shear vane tests are summarised in the following table:-

Strata	Cohesion (KN/m ²)
Low strength clay	38, 35, 32, 30, 38, 38, 28
Medium strength clay	45, 49

The results of SPT tests are summarised in the following table:-

Strata	N Value
Made ground	4, 3, 4, 4, 4
Extremely low strength clay	0
Low strength clay	5, 5
Medium dense sand/gravel	16, 12, 20, 19, 20, 16, 12, 13, 16
Medium strength clay	23
Dense sand/gravel	33, 37, 36, 33, 71, 36, 43, 35, 42
High strength clay	27
Mudstone	50/80, 25/20, 50/70, 25/10, 45/115, 20/75, 50/25, 25/10, 50/75, 33/75

3.08 Gas Monitoring:

Date: 20th August 2019				Atmospheric Pressure 1003 mb		
Borehole	Water Level (m)	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Hydrogen Sulphide (ppm)	Flow Rate l/h
BH2/R2	1.60	0.0	3.8	14.4	0.0	<0.1
R3	1.80	0.0	3.1	17.2	0.0	<0.1
BH4/R4	2.00	0.0	4.6	15.2	0.0	<0.1
BH5	1.90	0.0	3.0	18.0	0.0	<0.1

Date: 19 th September 2019				Atmospheric Pressure 1024 mb		
Borehole	Water Level (m)	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Hydrogen Sulphide (ppm)	Flow Rate l/h
BH2/R2	1.70	0.0	1.5	18.2	0.0	<0.1
R3	1.70	0.0	9.6	5.6	0.0	<0.1
BH4/R4	*	*	*	*	0.0	*
BH5	1.80	0.0	1.0	19.4	0.0	<0.1

* well not accessible

Date: 1 st November 2019				Atmospheric Pressure 989 mb		
Borehole	Water Level (m)	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Hydrogen Sulphide (ppm)	Flow Rate l/h
BH2/R2	1.60	0.0	1.8	16.9	0.0	<0.1
R3	1.60	0.0	3.8	16.8	0.0	<0.1
BH4/R4	*	*	*	*	0.0	*
BH5	1.70	0.2	0.7	2.2	0.0	<0.1

* well not accessible

Date: 15 November 2019			Atmospheric Pressure 1001mb			
Borehole	Water Level (m)	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Hydrogen Sulphide (ppm)	Flow Rate l/h
BH2/R2	1.40	0.0	1.5	18.4	0.0	<0.1
R3	1.40	0.0	7.8	7.6	0.0	<0.1
BH4/R4	0.80	0.0	0.0	3.8	0.0	<0.1
BH5	1.50	0.0	0.2	12.4	0.0	<0.1

4.0 CONTAMINATION - DESIGN OBJECTIVES & PHILOSOPHY

4.01 Identification of Potential Hazards:

In January 2015 Land Quality Management Ltd (LQM) published Safe for Use Levels (S4UL's) for Human Health Risk Assessment introducing updated guidance for the assessment of risk to human health from land contamination. The S4UL's are based on assumptions on soil conditions, the existence of exposure pathways behaviour and type of contaminants. The apparent exceedance of the quoted S4UL's is taken as indicating that further detailed assessment is required or that remedial actions should be taken.

4.02 Sensitivity of Development:

The presence of elevated concentrations of particular analytes may present hazards in terms of personal health, damage to plant life and other environmental issues. The CLEA model and SGVs classified particular end uses on a scale of sensitivity.

Residential with home grown produce
Residential without home grown produce
Residential public open space
Allotments
Commercial/Industrial

4.03 Design Life:

It is important to recognise when considering a particular problem that the solution has finite life, a concept with which those in the construction industry are familiar. The design life is influenced by the materials used in construction, the environment and the degree of maintenance carried out to extend the design life.

Monitoring is required to determine whether a design is functioning correctly, commensurate with the prevailing environmental conditions. It is essential that future users are aware of today's solutions since historically most buildings and infrastructure works continue in service. The effect of an increased design life should not be allowed to prejudice the original design principles.

4.04 **Legislation:**

The principle legislation relating to a potential pollution and contamination problems addressed in the Environmental Protection Act 1990 and Environmental Act 1995.

For 'contaminated' land to exist a significant 'pollution linkage' must be present, that is, there should be a source of contamination, a pathway by which the contamination can migrate, to an identified 'receptor' where it could cause 'significant harm'.

Should any link within this chain be severed then the land may not strictly be regarded as 'contaminated land' under the Environmental Protection Act 1990. Based on the historic site usage and activities on and in the vicinity of the site it was anticipated that there may be contamination present on site use.

A ground investigation was commissioned to investigate soils and the chemical constituents of these soils, especially any made ground. The site was not expected to be severally contaminated and therefore a comprehensive testing regime based on the current industry standard BS 10175 : 2001 was not considered necessary. However, a contamination survey was undertaken with a provision that return visits would have to be made if contamination was exposed at a sufficient concentration to justify more extensive investigations.

4.05 **Design Objectives:**

- i) The objective of reclamation works is to improve any marginal land into ground suitable for its use for commercial use. The standards would be in accordance with the LQM/ CIEH S4UL's for Human Health Risk Assessment and SP1010: Development of Category 4 Screening Levels (C4SL's) for Assessment of Land Affected by Contamination as attached in Appendix I. The Assessment Criteria values are based upon an SOM of 1.0%. If considered appropriate a further quantitative risk assessment will be undertaken using calculated site-specific target values or S4UL's for SOM values obtained for the site by laboratory testing.
- ii) Risk Assessment
A qualitative risk assessment of any contaminants identified on the site will be undertaken. This will consider the significance of the contaminants identified in terms of source, pathway, receptor (ie. pollution linkage).

5.0 **DISCUSSION**

5.01 **Soils:**

The investigation has revealed the presence of made ground on the site. The Desk Study for the site indicated potential for contamination to be present on the site and the regime of chemical analyses adopted reflects this.

The results have been assessed using the Assessment Criteria for commercial use proposed in Appendix I.

The test results from samples taken from the made ground on the site are compared in the following table:-

Contaminant	Concentrations in soils mg/kg*	No. of samples tested	Assessment Criteria mg/kg	No. of samples exceeding Assessment Criteria
Arsenic	7.0 – 45.0	10	640	0
Cadmium	0.22 – 1.0	10	410	0
Chromium	15.0 – 50.0	10	8600	0
Lead	17.0 – 310	10	2300	0
Mercury	<0.1 – <1.0	10	1100	0
Selenium	<0.2 – <3.0	10	12000	0
Copper	12.0 – 100	10	68000	0
Nickel	14.0 – 49.0	10	980	0
Zinc	44.0 - 290	10	730000	0
Boron (water soluble)	0.46 – 1.2	10	240000	0
Sulphate (water soluble)	<0.07 – 0.89 g/l	10	-	-
pH	6.4 – 11.2	10	<5.0	0
Phenols	<0.3 – 1.3	10		0
Asbestos	Detected/Not Detected	8		1
PAH	4.4 – 430	10	#	#

* unless stated otherwise

see table below

Speciated PAH analysis of samples from the made ground on the site are summarised in the following table:-

PAH 16 EPA	Concentrations in soils mg/kg	No. of Samples tested	Assessment Criteria mg/kg	No. of Samples exceeding Assessment Criteria
Acenaphthene	<0.1 – 5.0	10	85000	0
Acenaphthylene	<0.1 – 1.1	10	84000	0
Anthracene	0.2 – 19.0	10	520000	0
Benzo (a) Anthracene	0.67 – 33.0	10	170	0
Benzo (a) Pyrene	0.3 – 33.0	10	77.0	0
Benzo (b) Fluoranthene	0.2 – 15.0	10	44.0	0
Benzo (k) Fluoranthene	0.3 – 16.0	10	1200	0
Benzo (g,h,i) Perylene	0.3 – 19.0	10	3900	0
Chrysene	0.4 – 37.0	10	350	0
Di-benzo (a,h) Anthracene	<0.1 – 6.1	10	3.5	1
Indeno (1, 2, 3-cd) Pyrene	0.1 – 22.0	10	500	0
Fluoranthene	0.8 – 84.0	10	23000	0
Fluorene	<0.1 – 3.3	10	63000	0
Naphthalene	<0.1 – 2.4	10	190	0
Phenanthrene	0.5 – 72.0	10	22000	0
Pyrene	0.8 – 79.0	10	54000	0
Total	4.4 – 430	10	-	-

When compared with the proposed Assessment Criteria in relation to commercial use the determinants with levels in excess of Assessment Criteria encountered in the made ground on the site were as follows:-

Di-benzo (a,h) Anthracene	1 No.	BH5	0.30 – 1.00m	6.1 mg/kg
Asbestos	1 No	TP6	0.90m	Amosite Chrysotile

The Upper Bound Value (US95) for the determinants with concentrations in excess of Assessment Criteria in the made ground have been calculated as follows:-

Di-benzo (a,h) Anthracene 2.15 mg/kg < AC of 3.3 mg/kg

The test results from samples taken from the natural ground on the site are compared in the following table:-

Contaminant	Concentrations in soils mg/kg*	No. of samples tested	Assessment Criteria mg/kg	No. of samples exceeding Assessment Criteria
Arsenic	7.0 – 34.0	2	640	0
Cadmium	<1.0 – 1.0	2	410	0
Chromium	28.0 – 51.0	2	8600	0
Lead	75.0 – 410	2	2300	0
Mercury	<1.0	2	1100	0
Selenium	<3.0	2	12000	0
Copper	24.0 – 140	2	68000	0
Nickel	26.0 – 37.0	2	980	0
Zinc	120 – 320	2	730000	0
Boron (water soluble)	<1.0	2	240000	0
Sulphate (water soluble)	0.03 – 0.35 g/l	14	-	-
pH	3.6 – 8.4	14	<5.0	1
Phenols	<1.0	2		0
PAH	2.7 – 13.0	2	#	#

* unless stated otherwise

see table below

The test results of speciated PAH analysis of samples from the natural ground on the site are summarised in the following table:-

PAH 16 EPA	Concentrations in soils mg/kg	No. of Samples tested	Assessment Criteria mg/kg	No. of Samples exceeding Assessment Criteria
Acenaphthene	<0.1 – 0.1	2	85000	0
Acenaphthylene	<0.1	2	84000	0
Anthracene	<0.1 – 0.2	2	520000	0
Benzo (a) Anthracene	0.1 – 1.1	2	170	0
Benzo (a) Pyrene	0.1 – 1.2	2	77.0	0
Benzo (b) Fluoranthene	<0.1 – 1.1	2	44.0	0
Benzo (k) Fluoranthene	0.1 – 1.0	2	1200	0
Benzo (g,h,i) Perylene	0.7 – 0.8	2	3900	0
Chrysene	0.1 – 1.3	2	350	0

Di-benzo (a,h) Anthracene	0.2	2	3.5	0
Indeno (1, 2, 3-cd)Pyrene	0.4 – 0.6	2	500	0
Fluoranthene	0.3 – 2.1	2	23000	0
Fluorene	<0.1	2	63000	0
Napthalene	<0.1 – 0.3	2	190	0
Phenanthrene	0.2 – 1.4	2	22000	0
Pyrene	0.3 – 1.9	2	54000	0
Total	2.7 – 13.0	2	-	-

When compared with the proposed Assessment Criteria in relation to commercial use no determinants with levels in excess of Assessment Criteria were encountered in the natural ground on the site.

In view of the above there appears to be a significant pollution linkage on the site in relation to asbestos in the made ground. However, asbestos was only encountered in the sample from TP6.

In view of the above the following remediation measures are recommended on the site:

- Vigilance will be required in relation to excavations in the made ground local to TP6 due to the possible presence of asbestos. If suspected asbestos based materials are encountered [eg pieces of asbestos cement sheeting] these should be isolated and stockpiled for testing and disposal at a suitably licensed tip.
- Excavations in the made ground should be kept damped down
- Service trenches should be backfilled with clean inert material.

5.02 **Controlled Waters:**

The levels of leachate contamination encountered in the made ground are not considered to pose a significant risk to controlled waters.

In addition, it should also be noted that:-

- the site will be 100% positively drained hardcover, which will limit the amount of rainwater percolating through the soils.
- the site is not in a Source Protection Zone.

5.03 **Mining:**

A coal seam between 0.40 and 0.5m thick was encountered in all boreholes between 9.80 and 12.5m below ground level. No evidence of workings were encountered in these seams. The rock cover to the seam varies between 2.3 and 4.0m. Due to the thin rock cover to this relatively thin seam and, as there is an overburden of between 6.40 and 8.5m, together with a relatively high water table, it is considered unlikely that this seam has been worked.

A further 0.3m thick coal seam was encountered in R4 at 22.00m below ground level. The rock cover to the seam is 12.0m, so there is adequate rock cover present even if this seam has been worked.

5.04 Gas:

Sources of Gas:

Radon protection measures are not required on the development.

Potential sources of methane and carbon dioxide gas are identified in Section 6.03 and are summarised in the following table. The table also gives an indication of the likely gas generation potential and the risk of gas generation increasing in the future.

Source Area	Generation potential of source	Risk of gas generation increasing in future
Made ground on the site	Very Low	Very Low
Known areas of made ground within 250m of the site	Very Low	Very Low
Possible coal seams below the site	Very Low	Very Low

Gas Pathways:

The typical ground conditions encountered during the investigation indicated made ground over clays over sands and gravels over mudstone and siltstone. Consequently, a direct gas migration pathway through the made ground to the surface exists.

Gas Monitoring:

The most recent guidance on gas risk assessment (CIRIA C665) includes recommendations for periods and frequencies for monitoring visits. These recommendations take into account the nature of the proposed development and the likely generation potential of the source, which are shown in the table below:

		Generation potential of source				
		Very Low	Low	Moderate	High	Very High
Sensitivity of development	High (residential with gardens)	6/3	9/6	12/6	24/12	24/24
	Moderate (flats)	6/2	6/3	9/6	12/12	24/24
	Low (commercial)	4/1	6/2	6/3	12/6	12/12
6/3 indicates 6 readings over 3 months. At least 2 readings should be taken during periods of low and falling atmospheric pressure						

The proposed development is a commercial extension. It is considered that the generation potential of the gas source (taking into account the likelihood of future increases in gas generation) is very low. Therefore, 4 readings over a period of 1 month will be taken.

Gas monitoring at the site to date has been carried out on four occasions. One of the monitoring visits we carried out when atmospheric pressure was below 1000mb.

A summary of the monitoring results is shown in the table below.

Monitoring Point	Gas concentrations recorded (% v/v)			Flow rates recorded (litre/hour)
	Methane	Carbon Dioxide	Hydrogen Sulphide (ppm)	
BH2/R2	0.0	1.5 - 3.8	0.0	<0.1
R3	0.0	3.9 - 9.6	0.0	<0.1
BH4/R4	0.0	0.0 - 4.6	0.0	<0.1
BH5	0.0 - 0.2	0.2 - 3.0	0.0	<0.1

ND: None detected

Site Gas Regime:

Where Flow rates are shown as L0.1 litres/hour a default value of 0.1 litres/hour has been used, representing the limit of detection of the measuring equipment.

The gas monitoring data has been appraised in order to assess the potential gas emission rate from the soils beneath the site.

Borehole gas screening values (GSV) for both methane and carbon dioxide have been calculated for each borehole and are shown in the table below.

Borehole No.:	Gas Screening Value – Methane (litre/hour)	Gas Screening Value – Carbon Dioxide (litre/hour)
BH2/R2	0.0	0.0038
R3	0.0	0.0096
BH4/R4	0.0	0.0046
BH5	0.0002	0.0030

Based on the maximum recorded concentrations of methane to date, the site is categorised in accordance with the modified Wilson and Card classification as Characteristic Situation 1.

Based on the GSVs obtained for methane to date the site is categorised in accordance with the modified Wilson and Card classification as Characteristic Situation 1.

Based on the maximum recorded concentrations of carbon dioxide to date, the site is categorised in accordance with the modified Wilson and Card classification as Characteristic Situation 2.

Based on the GSVs obtained for carbon dioxide to date the site is categorised in accordance with the modified Wilson and Card classification as Characteristic Situation 1.

Based on the gas readings taken to date the following gas protection measures are recommended on the development:-

- Reinforced concrete slab
- Low permeability carbon dioxide resistant membrane with tapped and lapped joints. The membrane is to be taken across cavities and sealed onto service entries.
- The gas membrane installation should be installed and validated in accordance with the YALPAG document Verification Requirements for gas protection systems.

The desk study data indicates the site is in an area where Radon protection measures are not required.

5.05 Foundations:

Extension

The made ground on the site are not considered to be a suitable founding strata as potentially damaging settlement could occur.

Reinforced spread foundations can be utilised on the extension bearing on the underlying soft and firm clays. The underside of foundations should be a minimum of 1.00m below finished ground level. If very soft clays or made ground are encountered at foundation level this material should be excavated and replaced with well compacted granular material.

A safe working bearing pressure of 40 KN/m³ should be adopted in the soft clays.

Waste Transfer Station

The made ground and very soft clays on the site are not considered to be a suitable founding strata as potentially damaging settlement could occur.

Whilst pad foundations can be utilised for the building bearing on the underlying medium dense/dense sands and gravels, de-watering would be required. Therefore, it is recommended that piled foundations support reinforced concrete pile caps are utilised.

Whilst it is envisaged driven piles can be used on the development advice should be sought from specialist piling contractors.

5.06 Ground Floor Construction:

Extension

Following removal of the existing service yard slab a ground bearing slab on well compacted hardcore sub-base can be utilised. Existing well graded granular made ground can be re-used as fill material. A geotextile such as Tensar TriAx should be provided in the sub-base.

5.07 Sulphate attack on Buried Concrete:

The results of the sulphate analysis compared to BRE Special Digest 1, 'Concrete in Aggressive Ground' indicate Class DS-2 conditions and ACEC site classification AC-1s.

5.08 Excavations:

Excavations in the cohesive made ground and clays are likely to be stable in the short term whereas excavations in the sands and gravels are likely to be very unstable, especially below the water table. Trench support should be provided in accordance with current Health & Safety Guidance.

Groundwater is likely to be encountered in foundation and drainage excavations in excess of 2.00m deep. However, it should be noted that the groundwater table level is likely to be subject to seasonal variations.

5.09 Pavements:

The existing made ground on the site should be excavated, screened to remove unsuitable material and replaced and compacted to an engineering specification. A Type 1 stone sub-base should be provided together with a geotextile such as Tensar TriAx at formation level. Soft spots in the clay formation may need to be excavated and replaced with compacted granular material. Oversized stone can be rolled into the clay to stiffen the formation.

5.10 Drainage:

A conventional granular bed and surround to drainage can be adopted on the development

6.0 CONTAMINATION ASSESSMENT**6.01 General:**

In order to evaluate the environmental risks identified during the investigation, a simple source-pathway-target model has been developed and is summarised at the end of this section in table form. The model has been used to determine significant

pollutant linkages and identify suitable risk management proposals on which the remediation design is based.

6.02 Sources:

Chemical analysis of samples have indicated the presence of Asbestos in the made ground on the site in one location.

6.03 Pathways:

The following potential contamination pathways have been identified on the site:-

Horizontal and vertical migration pathways of leachate through the potentially permeable soils.

Human Uptake Pathways (derived from CLEA model and LQA for residential use):-

- Ingestion of soil
- Ingestion of indoor dust
- Dermal contact with soil
- Contact with indoor dust
- Inhalation of vapours outside
- Inhalation of vapours inside
- Vertical and lateral migration of volatile vapours and ground gas
- Indirect ingestion
- Airborne hazardous fibres
- Plant root uptake.

6.04 Targets:

The following environmental receptors have been identified on site:-

- Groundwater residing in the underlying geology
- Buildings / Structures
- Flora / Fauna
- Underground services
- Third party land.

The following human receptors have been identified on the site:-

- Construction workers
- Maintenance workers
- End users.

CoDa Structures

Consulting Civil & Structural
Engineers
14 Springfield Court
GUISELEY
Leeds LS20 8FD

**PHASE 2 ENGINEERING & ENVIRONMENTAL ASSESSMENT
FOR A PROPOSED EXTENSION AND WASTER TRANSFER STATION AT
BARR STREET, HUDDERSFIELD**

6.05 Assessed Risk – Made Ground –Asbestos –local to TP6

SOURCES	PATHWAYS	TARGETS	LIKELIHOOD OF OCCURRENCE	SEVERITY OF CONSEQUENCE	RISK RATING	RISK MANAGEMENT ACTION TAKEN
Made Ground	Direct Ingestion/ Inhalation or Contact	End Users	Unlikely	Severe	Low	Made ground, capped with concrete hardstanding.
	Direct Ingestion/ Inhalation or Contact	Construction workers	Likely	Severe	High	Vigilance will be required in relation to excavations in the made ground local to TP6 due to the possible presence of asbestos. Excavations in the made ground should be kept damped down Induction, PPR, high standard of personal hygiene.
	Indirect Ingestion	End Users	Unlikely	Severe	Low	Made ground, capped with concrete hardstanding.
	Indirect Ingestion	Construction workers	UnLikely	Severe	Low	Induction, PPE, high standard of personal hygiene.
	Root Uptake	Plants	UnLikely	Medium	Low	No landscape areas on the development.
	Vertical/lateral migration to controlled waters	Aquifer Watercourse	Unlikely	Medium	Low	100% of the site will be positively drained hardcover, there will therefore be limited rainwater percolating through the ground. The site is not within a Source Protection Zone.

Client: R. N. WOOLER & CO LTD
Project No: 7916
Date: 25 November 2019 revA

7.0 RECLAMATION PROPOSALS

The proposed works shall include the following, although this does not necessarily indicate the order or full extent of the works.

- Disconnect and/or divert any live services on the site as required by the development.
- Inspect the site for hazardous materials visible on the surface, remove from site together with any fly tipping and rubbish to a suitably licensed tip, using approved methods and a suitably licensed contractor.
- After the initial site strip the formation is to be inspected. Any areas of deleterious material or contamination not identified in the ground investigation identified by visual or olfactory evidence and subsequent chemical testing is to be remediated if necessary, in accordance with a risk assessment.
- Vigilance will be required in relation to excavations in the made ground local to TP6 due to the possible presence of asbestos. If suspected asbestos based materials are encountered [eg pieces of asbestos cement sheeting] these should be isolated and stockpiled for testing and disposal at a suitably licensed tip.
- Excavations in the made ground should be kept damped down
- The removal of any contamination 'hot spots', if encountered, is to be verified by sampling and testing of the sides and base of any such excavations.
- Made ground will need to be kept damped down during site works.
- Service trenches are to be backfilled with clean inert materials.
- The following gas protection measures are recommended on the development:-
 - Reinforced concrete slab
 - Low permeability carbon dioxide resistant membrane with tapped and lapped joints. The membrane is to be taken across cavities and sealed onto service entries.
 - The gas membrane installation should be installed and validated in accordance with the YALPAG document Verification Requirements for gas protection systems.
- Any engineering fill material should be compacted in accordance with the Dpt. Highways Specification.
- Arisings from the made ground on the site, other than those containing asbestos, may be classified as inert but guidance should be sought from the local Waste Management Regulation Office regarding the disposal of soils from the site.

8.0 SUMMARY

Site Name & Location	Myers, Bar Street, Huddersfield						
Proposal	Extension to existing facility and new waste transfer station						
Local Authority	Kirklees Council						
Ground Conditions	The following ground conditions were encountered in the window sampling borehole investigation:-						
	Strata	Location					
		TP1	TP2	TP3	TP4	TP5	TP6
	Approx. Ground Level (metres)	58.30	58.40	58.45	58.30	58.45	58.40
	Concrete slab	0.19m	0.17m	0.22m	0.17,	0.15m	0.20m
	Made Ground	0.19 - 0.85m	0.17 - 0.50m	0.22 - 0.50m	0.17 - 0.45m	0.15 - 0.55m	0.20 - 1.8m
	Silt	0.85 - 1.05m	-	-	-	-	-
	Clay	1.05 - 1.50m (firm, medium strength) 1.50-2.10m (soft, low strength)	0.50 - 0.70m (soft, low strength) 0.7-1.60m (b)	0.50 - 2.20m (soft, low strength)	0.45 - 1.60m (soft, low strength)	0.55 - 0.75m 0.75 - 2.00m (soft, low strength)	
	Sand	2.10 - 2.35m	1.60 - 2.20m	2.20 - 2.40m	1.60 - 2.30m	2.00 - 2.40m	1.80 - 1.95m
	Stability	(Continuous collapse of pit walls at 2.30m)	Continuous collapse of pit walls at 2.20m	(Continuous collapse of pit walls at 2.30m)	(Continuous collapse of pit walls at 2.30m)	(Continuous collapse of pit walls at 2.30m)	(Continuous collapse of pit walls at 2.30m)
<p>A concrete slab between 0.15 and 0.22m thick was encountered in all the trial pits. Made ground was encountered in all the trial pits and varied in thickness between 0.45 and 1.80m. The made ground encountered generally comprised of stone, gravel, grit and sand.</p> <p>The following ground conditions were encountered in the Cable Percussion and Rotary Borehole investigation:</p>							
Borehole BH1							
Strata	Thickness (m)						
Concrete	0.30						
Made Ground	1.70						
Medium Gravel	1.10						
Dense Gravel	5.30						
Mudstone	0.72						
Borehole BH2/R2							
Strata	Thickness (m)						
Concrete	0.30						
Made Ground	1.60						
Medium Dense Gravel	1.50						
Very Dense Gravel	0.80						
Stiff Clay	0.30						
Dense Gravel	1.80						
Medium Dense Gravel	2.20						
Mudstone	4.80						
Siltstone	6.10						
Mudstone	4.60						
Siltstone	6.00						
Borehole R3							
Strata	Thickness (m)						

Concrete	0.25
Made Ground	0.55
Soft Clay	0.70
Sand	0.50
Sand & Gravel	6.20
Shale	1.30
Mudstone	1.00
Coal	0.50
Siltstone	8.30
Shale	1.10
Mudstone	3.60

Borehole BH4/R4	
Strata	Thickness (m)
Concrete	0.30
Made Ground	1.70
Soft Clay	0.80
Dense Gravel	0.40
Clay	0.80
Medium Dense Gravel	0.90
Stiff Clay	1.10
Mudstone	2.80
Coal	0.50
Siltstone	6.70
Mudstone	5.00
Coal	0.30
Mudstone	0.30
Siltstone	5.50
Mudstone	1.90

Borehole BH5	
Strata	Thickness (m)
Concrete	0.30
Made Ground	1.70
Soft clay	1.80
Dense Gravel	4.60
Mudstone	0.62

Borehole BH6	
Strata	Thickness (m)
Concrete	0.30
Made Ground	1.70
Very soft clay	0.80
Medium Gravel	3.20
Firm clay	0.60
Medium dense Gravel	1.20
Mudstone	1.25

Groundwater

The following groundwater conditions were encountered in the trial pit borehole investigation:-

Strata	Location					
	TP1	TP2	TP3	TP4	TP5	TP6
Approx. Ground Level (m AOD)	58.30	58.40	58.45	58.30	58.45	58.40
Groundwater	Moderate flow at 2.30m	Moderate flow at 2.20m	Moderate flow at 2.30m	Moderate flow at 2.25m	Moderate flow at 2.30m	Moderate flow at 1.95m

Groundwater was encountered in the borehole investigation as follows:-

- BH1 – inflow at 1.90m begl rising to 1.60m begl in 20 minutes.
- BH2 – inflow at 1.90m begl rising to 1.60m begl in 20 minutes.
- BH2 – inflow at 3.40m begl rising to 1.50m begl in 20 minutes.
- R2 - fast inflow at 24.00m begl rising to 1.10m begl in 20 minutes.

- R3 - medium inflow at 2.00m.
- BH4 – inflow at 2.80m begl rising to 3.20m begl in 20 minutes.
- BH4 – inflow at 4.00m begl rising to 2.30m begl in 20 minutes.
- R4 - fast inflow at 9.60m begl rising to 1.75m begl in 20 minutes.
- BH5 – inflow at 3.80m begl rising to 1.60m begl in 20 minutes.
- BH6 – inflow at 2.80m begl rising to 2.40m begl in 20 minutes.
- BH6 – inflow at 5.00m begl rising to 1.90m begl in 20 minutes.
- BH6 – inflow at 6.60m begl rising to 1.50m begl in 20 minutes.

Groundwater levels measured during the gas monitoring period are indicated in the following table:

Borehole	Date			
	28.08.19	19.09.19	01.11.19	15.11.19
BH2/R2	1.60m	1.70m	1.60m	1.40m
R3	1.80m	1.70m	1.60m	1.40m
BH4/R4	2.00m	*	*	0.80m
BH5	1.90m	1.80m	1.70m	1.50m

Mining Issues	<p>A coal seam between 0.40 and 0.5m thick was encountered in all boreholes between 9.80 and 12.5m below ground level. No evidence of workings were encountered in these seams. The rock cover to the seam varies between 2.3 and 4.0m. Due to the thin rock cover to this relatively thin seam and, as there is an overburden of between 6.40 and 8.5m, together with a relatively high water table, it is considered unlikely that this seam has been worked.</p> <p>A further 0.3m thick coal seam was encountered in R4 at 22.00m below ground level. The rock cover to the seam is 12.0m, so there is adequate rock cover present even if this seam has been worked.</p>					
Foundations	<p>Extension The made ground on the site are not considered to be a suitable founding strata as potentially damaging settlement could occur. Reinforced spread foundations can be utilised on the extension bearing on the underlying soft and firm clays. The underside of foundations should be a minimum of 1.00m below finished ground level. If very soft clays or made ground are encountered at foundation level this material should be excavated and replaced with well compacted granular material. A safe working bearing pressure of 50 KN/m³ should be adopted in the soft clays.</p> <p>Waste Transfer Station The made ground and very soft clays on the site are not considered to be a suitable founding strata as potentially damaging settlement could occur. Whilst pad foundations can be utilised for the building bearing on the underlying medium dense/dense sands and gravels, de-watering would be required. Therefore, it is recommended that piled foundations support reinforced concrete pile caps are utilised. Whilst it is envisaged driven piles can be used on the development advice should be sought from specialist piling contractors.</p>					
Ground Floor Slabs	<p>Extension Following removal of the existing service yard slab a ground bearing slab on well compacted hardcore sub-base can be utilised. Existing well graded granular made ground can be re-used as fill material. A geotextile such as Tensar TriAx should be provided in the sub-base.</p>					
Building Near Trees	Not applicable.					
Dewatering	Groundwater is likely to be encountered in foundation and drainage excavations in excess of 2.00m deep. However, it should be noted that the groundwater table level is likely to be subject to seasonal variations.					
Excavations	Excavations in the cohesive made ground and clays are likely to be stable in the short term whereas excavations in the sands and gravels are likely to be very unstable, especially below the water table. Trench support should be provided in accordance with current Health & Safety Guidance.					
Sulphate Classification	The results of the sulphate analysis compared to BRE Special Digest 1 'Concrete in Aggressive Ground' indicate Class DS-2 conditions and ACEC site classification AC-1s.					
Contamination Assessment – soils	<p>When compared with the proposed Assessment Criteria in relation to commercial use the Determinants with levels in excess of Assessment Criteria encountered in the made ground on the site were as follows:-</p> <table border="1"> <tr> <td>Di-benzo (a,h) Anthracene</td> <td>i No.</td> <td>BH5</td> <td>0.30 – 1.00m</td> <td>6.1 mg/kg</td> </tr> </table>	Di-benzo (a,h) Anthracene	i No.	BH5	0.30 – 1.00m	6.1 mg/kg
Di-benzo (a,h) Anthracene	i No.	BH5	0.30 – 1.00m	6.1 mg/kg		

	Asbestos	1 No	TP6	0.90m	Amosite Chrysotile
	<p>The Upper Bound Value (US95) for the determinants with concentrations in excess of Assessment Criteria in the made ground have been calculated as follows:- Di-benzo (a,h) Anthracene 2.15 mg/kg < AC of 3.3 mg/kg When compared with the proposed Assessment Criteria in relation to commercial use no determinants with levels in excess of Assessment Criteria were encountered in the natural ground on the site.</p>				
Controlled Waters	<p>The levels of leachate contamination encountered in the made ground are not considered to pose a significant risk to controlled waters. In addition, it should also be noted that:- - the site will be 100% positively drained hardcover, which will limit the amount of rainwater percolating through the soils. - the site is not in a Source Protection Zone.</p>				
Remediation Proposals	<p>- Vigilance will be required in relation to excavations in the made ground local to TP6 due to the possible presence of asbestos. If suspected asbestos based materials are encountered [eg pieces of asbestos cement sheeting] these should be isolated and stockpiled for testing and disposal at a suitably licensed tip. - Excavations in the made ground should be kept damped down - Service trenches should be backfilled with clean inert material.</p>				
Remediation Statement	Not required.				
Gas Protection Measures	<p>The following gas protection measures are required on the development Reinforced concrete slab Low permeability carbon dioxide resistant membrane with tapped and lapped joints. The membrane is to be taken across cavities and sealed onto service entries. The gas membrane installation should be installed and validated in accordance with the YALPAG document Verification Requirements for gas protection systems.</p>				
Radon	No protection measures are required on the development.				
Drainage	A conventional granular bed and surround to drainage can be adopted on the development.				
Unforeseen Circumstances	Should any areas of previously identified potentially contaminated soil be encountered during site construction works we would recommend consultation with CoDA Structures to ensure that the recommendations continue to apply.				
Construction Works	It is recommended that construction personnel with direct contact with the soils at the site use appropriate PPE equipment (i.e. gloves and overalls) together with welfare facilities in accordance with general health and safety guidelines.				
Utilities	We would recommend that a copy of the ground investigation report when available, is supplied to Utility Companies, and that their recommendations relating to appropriate supply pipes are adhered to.				
Statutory Consultation	We would recommend that a copy of the ground investigation report once prepared is issued to the Local Authority for comment and approval prior to the development of the site.				

14.0 CAVEATS

- 14.01 The comments given in this report and recommendations made are based on the information that could be obtained from reasonably accessible sources. Discussions have not yet been held with statutory bodies and the local authority.
- 14.02 The comments and recommendations made in this report are based on the ground conditions encountered during the site work, and on the results of laboratory testing on a selected number of samples taken in the field. There may be conditions prevailing at the site with respect to ground conditions and contamination that have not been encountered during the investigations, and which have therefore not been taken into account in this report.
- 14.02 This report has been prepared for the sole use of R. N. Wooler & Co Ltd and their development funders unless agreed otherwise in writing by CoDA Structures.

redacted

Signed:

J _____

APPENDIX 'A'

LIST OF DOCUMENTS REFERRED TO:

- BGS Geological Sheet
- Preliminary Site Assessment and Coal Mining Risk Assessment Report -
(Ref: 07031-CUR-OO-XX-RP-GE-001)
- CIRIA C552 (2001) Contaminated Land Risk Assessment
- LQM Ltd. Safe for Use Levels (S4UL's)
- Category 4 Screening Levels
- BRE Special Digest 1, 'Concrete in Aggregate Ground'
- CIRIA C665 : 'Assessing Risks posed by Hazardous Ground Gases to
Buildings'

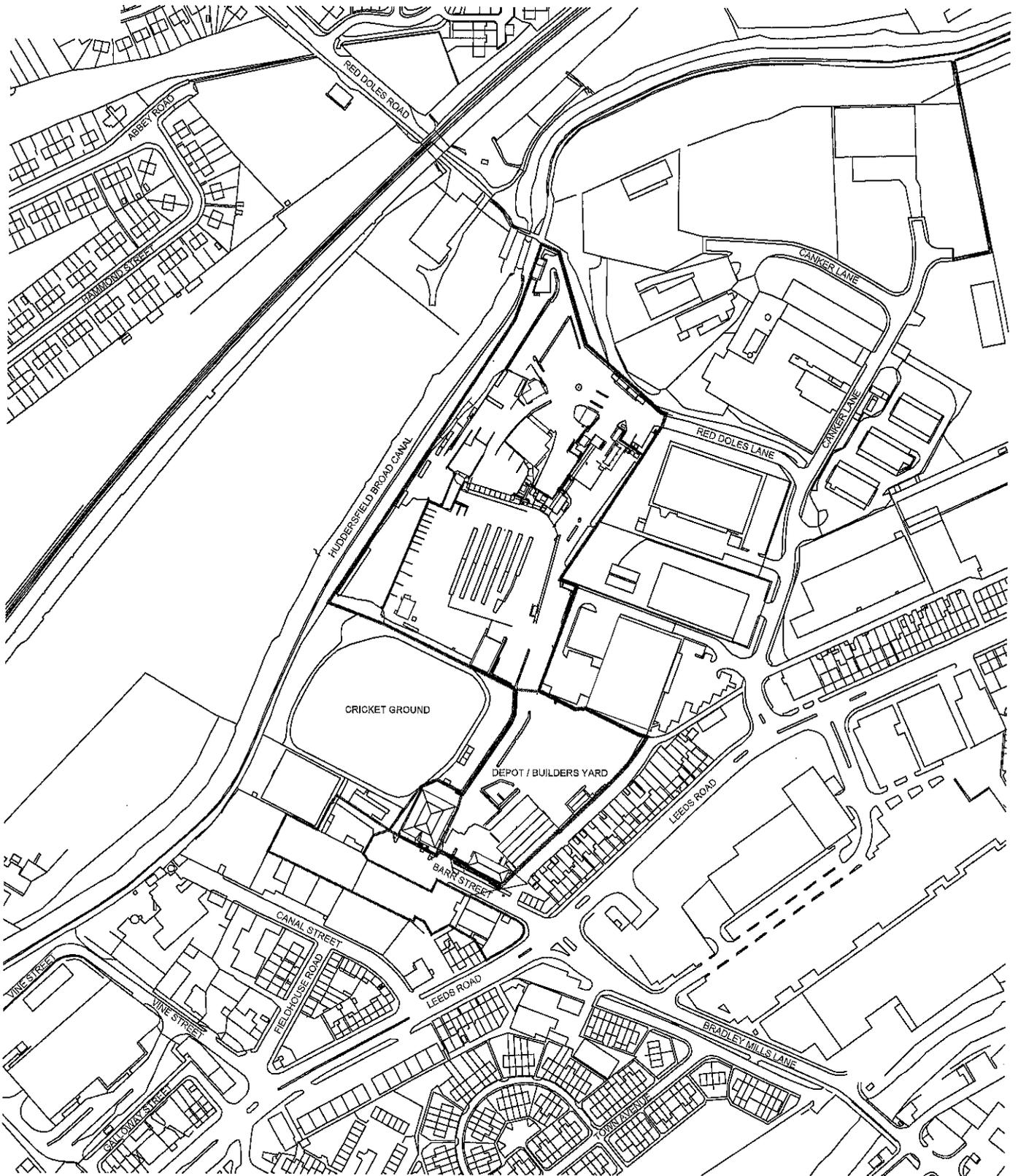
CoDa Structures

Consulting Civil & Structural Engineers
14 Springfield Court
GUISELEY
Leeds LS20 8FD

**PHASE 2 ENGINEERING & ENVIRONMENTAL
ASSESSMENT
FOR A PROPOSED EXTENSION AND WASTER
TRANSFER STATION AT
BARR STREET, HUDDERSFIELD**

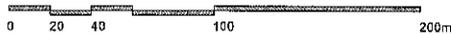
APPENDIX B

SITE LOCATION PLAN - FIG. 1

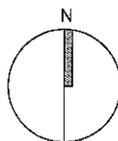


Location Plan

Scale 1:2500



- Key:**
- Site Boundary
 - Ownership Boundary



Rev A: 2018.10.25 :JAH : JAH Drawing updated for Planning Issue.

Issue Purpose: INFORMATION

PARK
designed

The LOFT, Unit 13
Clifton Mills,
Leeds,
LS12 2DS
T: 0113 816 8057
www.parkdesigned.com
info@parkdesigned.com

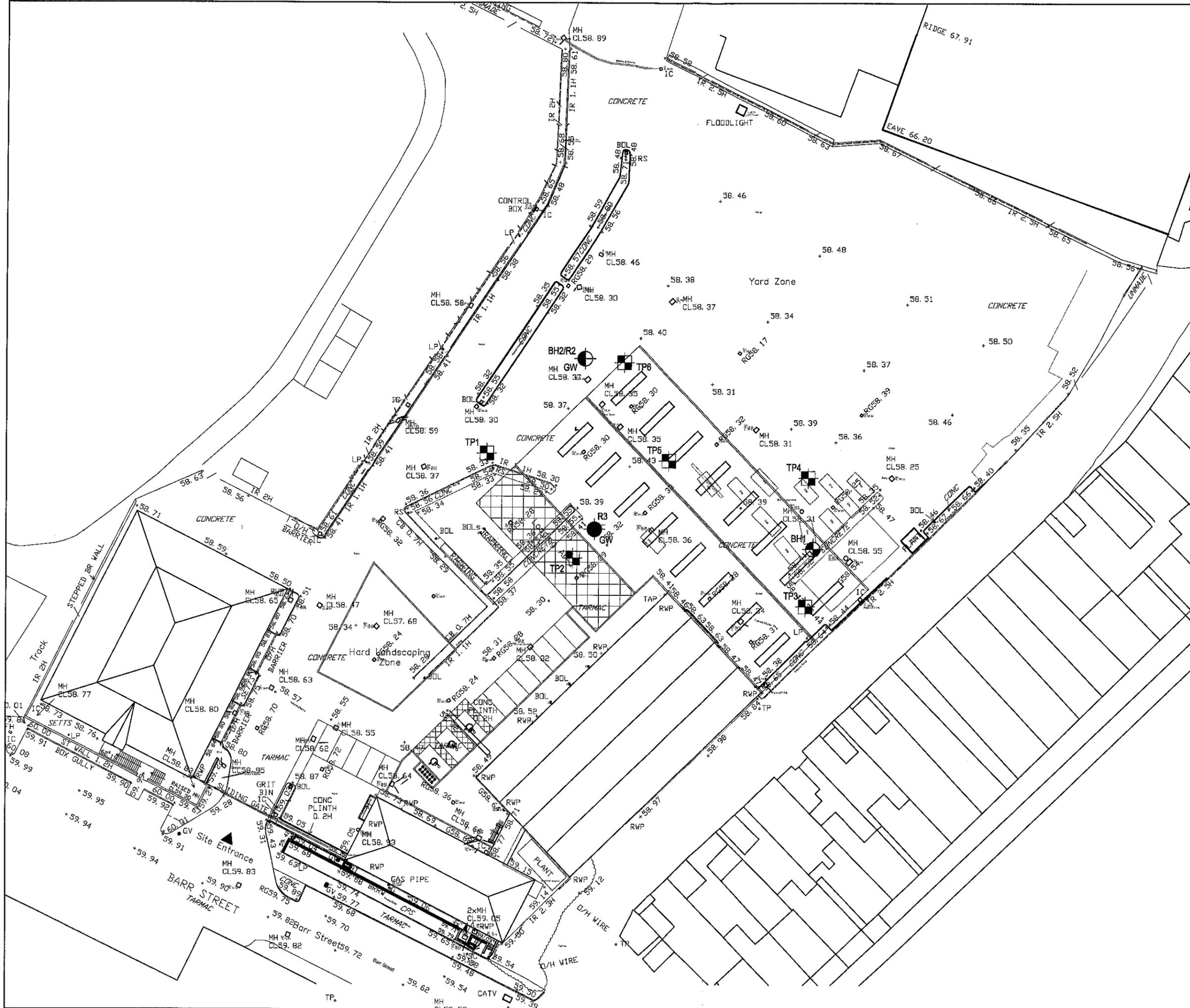
Client	Myers Group Ltd	Date	July 2018
Project	Myers, Barr Street, Huddersfield, HD1 6PB	Scale	1:2500 @ A3
Title	Location Plan	Drawn	CH AML EP
Job No.	18.11-D - 02 - 001 - A	Rev.	01
Stage	Design - D	Planning - P	Tender - T
Series	Construction - C	Record - R	

*For the purposes of Planning Consent the following applies to any copy of this drawing made by the Local Authority:

This copy has been made by and with the authority of the person required to make the plan and drawing open to public inspection pursuant to Section 47 of the Copyright, Designs and Patents Act 1988. Unless that Act provides a relevant exception to copyright, the copy must not be copied without the prior permission of the copyright owner. If any copy is made under the authority only the whole drawing including the copyright holder's name and this notice, is to be copied.
DO NOT SCALE this drawing, figured dimensions only are to be used. This drawing is the sole copyright of PARKdesigned. Any discrepancies between this drawing and other information should be reported to the Architect.

APPENDIX C

SITE PLAN AND SITE TOPOGRAPHICAL SURVEY – FIG. 2



Notes

Key:-

- TP1-6 Denotes Trial Pits excavated by CDA structures on 25 July 2019
- BH1,586 Denotes cable percussions boreholes drilled on 20,27 & 28 August 2019
- BH2/R2, BH4/R2 Denotes cable percussion boreholes drilled with rotary follow-on on 21, 22 & 23 August 2019
- R3 Denotes rotary borehole drilled on 25 July 2019
- GW Denotes Gas Well

Rev.	Content	Date

Client R N Wooler & Co. Ltd			
Project Barr Street, Huddersfield			
Title Site Topographical Survey - Sheet 1			
Drawn RD	Date 07.10.19	Drg. No.	Rev.
Scale 1:250 @A1	Checked JL	7916/Fig2	-

CoDa Structures
 Consulting Civil & Structural Engineers
 14 Springfield Court
 Guiseley
 Leeds LS20 8PD
 Tel: 01943 872667
 Fax: 01943 870824

CoDa Structures

Consulting Civil & Structural Engineers
14 Springfield Court
GUISELEY
Leeds LS20 8FD

**PHASE 2 ENGINEERING & ENVIRONMENTAL
ASSESSMENT
FOR A PROPOSED EXTENSION AND WASTER
TRANSFER STATION AT
BARR STREET, HUDDERSFIELD**

APPENDIX D

SITE AERIAL PHOTOGRAPH

Legend



Blair S



Untitled Map

Write a description for your map.

Google Earth

© 2015 Google

CoDa Structures

Consulting Civil & Structural Engineers
14 Springfield Court
GUISELEY
Leeds LS20 8FD

**PHASE 2 ENGINEERING & ENVIRONMENTAL
ASSESSMENT
FOR A PROPOSED EXTENSION AND WASTER
TRANSFER STATION AT
BARR STREET, HUDDERSFIELD**

APPENDIX E

TRIAL PIT LOGS

					Site		Trial Pit Number					
Excavation Method MECHANICAL EXCAVATOR					Dimensions 2.5m x 0.6m (approx)		Ground Level (mOD)		Client CODA STRUCTURES		Job Number	
					Location AS PLAN		Dates 25/07/2019		Engineer		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water				
0.20	D				(0.19)	MADE GROUND: concrete surfacing.						
					0.19 (0.26)	MADE GROUND: brown coarse sand and gravel sized fragments of stone.						
0.50	D				0.45 (0.40)	MADE GROUND: dark brown coarse sand and gravel sized fragments of stone.						
0.90	D				0.85 (0.20)	Dark grey clayey SILT.						
1.15	D		HV@1.10m, c=45kPa		1.05 (0.45)	Firm medium strength grey silty CLAY.						
1.40	D		HV@1.30m, c=50kPa		1.50	Soft low strength silty CLAY.						
1.80	D		HV@1.60m, c=38kPa		(0.60)							
2.20	D				2.10 (0.25)	Grey silty coarse SAND with some cobble sized fragments of stone.		∇1				
2.30	B		Moderate inflow(1) at 2.30m. 25/07/2019:		2.35	Complete at 2.35m						
Plan						Remarks						
						Moderate groundwater inflow at 2.30m Continual collapse of pit sides. HV = Hand Shear Vane test On completion backfilled with arisings.						
						Scale (approx)		Logged By		Figure No.		
1:25		DS/SJ										

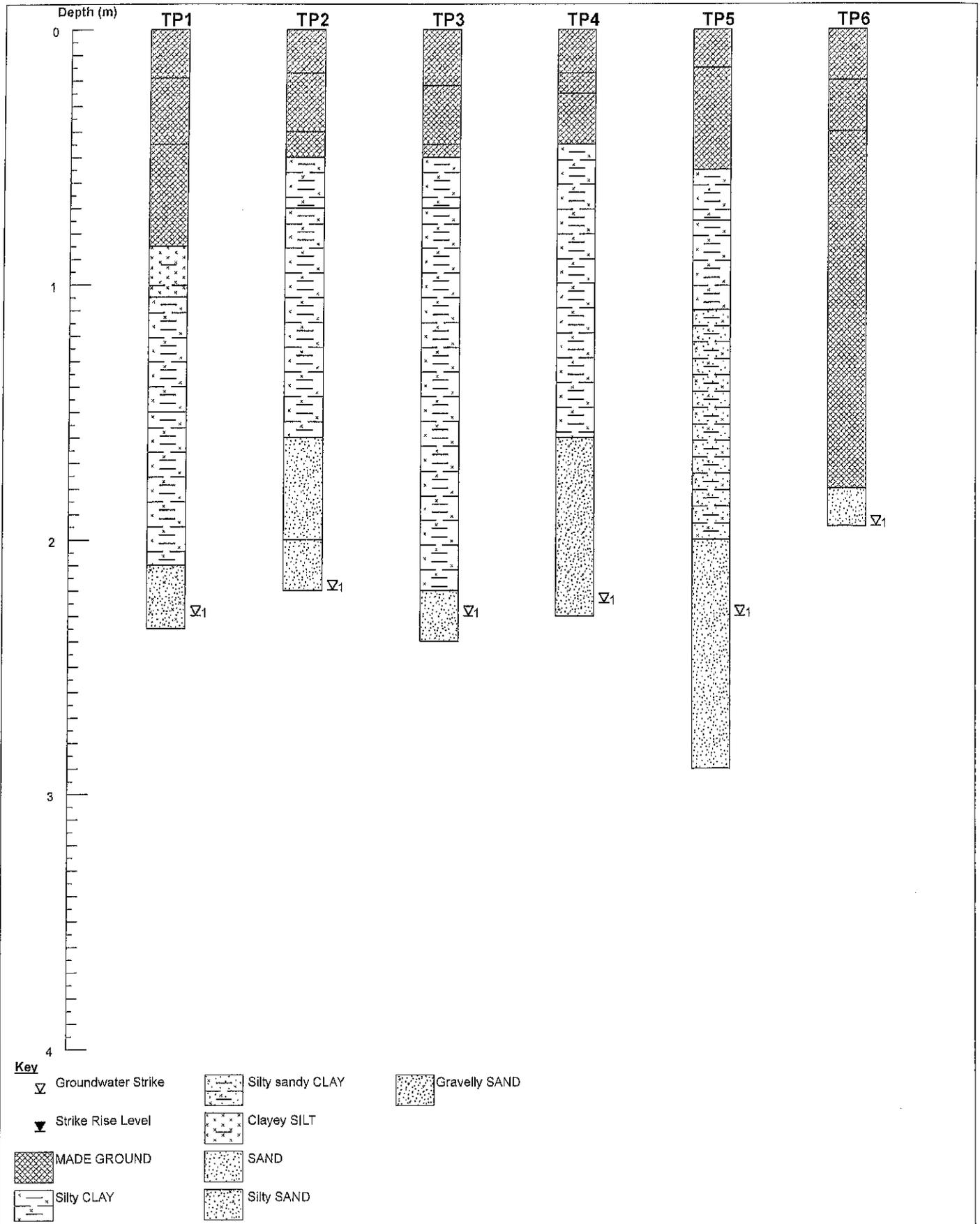
						Site	Trail Pit Number	
Excavation Method		Dimensions		Ground Level (mOD)		Client	Job Number	
MECHANICAL EXCAVATOR		2.5m x 0.6m (approx)				CODA STRUCTURES		
		Location		Dates		Engineer	Sheet	
		AS PLAN		25/07/2019			1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.20	D				(0.17) 0.17	MADE GROUND: reinforced concrete.		
					(0.23)	MADE GROUND: brown coarse sand and gravel.		
0.45	D				0.40 (0.10) 0.50	MADE GROUND: grey gravel sized fragments of stone.		
0.55	D		HV@0.60m, c=35kPa		(0.20)	Soft low strength gray silty CLAY.		
0.80	D				0.70	Firm medium strength orange brown silty CLAY.		
					(0.90)			
1.65	D		HV@1.20m, c=49kPa		1.60	Brown coarse SAND.		
					(0.40)			
2.10	D				2.00	Grey medium SAND.		
					(0.20)			
			Moderate Inflow(1) at 2.20m. 25/07/2019:		2.20	Complete at 2.20m		∇1
Plan						Remarks		
						Moderate groundwater inflow at 2.20m Continual collapse of pit sides. HV = Hand Shear Vane test On completion backfilled with arisings.		
						Scale (approx)	Logged By	Figure No.
						1:25	DS/SJ	

Excavation Method						Site		Trial Pit Number	
MECHANICAL EXCAVATOR						MYERS BUILDERS MERCHANTS, BARR STREET, HUDDERSFIELD, WEST YORKSHIRE		TP3	
Dimensions			Ground Level (mOD)			Client		Job Number	
2.5m x 0.6m (approx)						CODA STRUCTURES			
Location			Dates			Engineer		Sheet	
AS PLAN			25/07/2019					1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Leger	d	Water
0.30	D				(0.22)	MADE GROUND: reinforced concrete.			
0.45	D				0.22 (0.23)	MADE GROUND: brown coarse sand and gravel sized fragments of stone.			
0.60	D		HV@0.60m, c=32kPa		0.45 (0.20)	MADE GROUND: grey gravel sized fragments of stone.			
0.90	D				0.70	Soft low strength grey silty CLAY.			
1.60	D		HV@1.40m, c=30kPa		(1.50)	Soft low strength brown and grey mottled becoming yellow brown silty CLAY			
2.30	D		Moderate Inflow(1) at 2.30m. 25/07/2019:		2.20 (0.20)	Grey medium SAND.			∇1
					2.40	Complete at 2.40m			
Plan						Remarks			
						Moderate groundwater Inflow at 2.30m Continual collapse of pit sides. HV = Hand Shear Vane test On completion backfilled with arisings.			
						Scale (approx)		Logged By	
						1:25		DS/SJ	
						Figure No.			

Excavation Method						Site		Trial Pit Number			
MECHANICAL EXCAVATOR						MYERS BUILDERS MERCHANTS, BARR STREET, HUDDERSFIELD, WEST YORKSHIRE		TP4			
Dimensions			Ground Level (mOD)			Client		Job Number			
2.5m x 0.6m (approx)						CODA STRUCTURES					
Location			Dates			Engineer		Sheet			
AS PLAN			25/07/2019					1/1			
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water			
0.20	D				(0.17)	MADE GROUND: reinforced concrete.					
					(0.17)	MADE GROUND: brown coarse sand and gravel sized fragments of stone.					
0.40	D				(0.20)	MADE GROUND: dark grey silty clay.					
					0.45	Soft low strength brown silty CLAY.					
0.90	D				(1.15)						
			HV@1.20m, c=38kPa								
1.65	D				1.60	Brown and grey slightly gravelly coarse SAND with low cobble content.					
					(0.70)						
2.20	D				2.30	Complete at 2.30m		▽1			
			Moderate Inflow(1) at 2.25m. 25/07/2019:								
Plan						Remarks					
.						Moderate groundwater inflow at 2.25m.					
.						Continual collapse of pit sides.					
.						HV = Hand Shear Vane test					
.						On completion backfilled with arisings.					
.						Scale (approx)		Logged By		Figure No.	
.						1:25		DS/SJ			

					Site		Trial Pit Number	
					MYERS BUILDERS MERCHANTS, BARR STREET, HUDDERSFIELD, WEST YORKSHIRE		TP5	
Excavation Method		Dimensions		Ground Level (mOD)		Client		Job Number
MECHANICAL EXCAVATOR		2.5m x 0.6m (approx)				CODA STRUCTURES		
		Location		Dates		Engineer		Sheet
		AS PLAN		25/07/2019				1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.40	D				(0.15) 0.15	MADE GROUND: reinforced concrete.		
					(0.40)	MADE GROUND: brown coarse sand and gravel sized fragments of stone.		
0.60	D				0.55 (0.20)	Friable grey silty CLAY.		
0.90	D		HV@0.90m, c=38kPa		0.75 (0.35)	Soft low strength brown silty CLAY.		
1.50	D		HV@1.50m, c=28kPa		1.10 (0.90)	Soft low strength brown sandy silty CLAY.		
2.20	D		Moderate Inflow(1) at 2.30m.		2.00 (0.90)	Grey silty coarse SAND with medium cobble content.		∇1
			25/07/2019:		2.90	Complete at 2.90m		
Plan					Remarks			
					Moderate groundwater inflow at 2.30m Continual collapse of pit sides. HV = Hand Shear Vane test On completion backfilled with arisings.			
					Scale (approx)		Logged By	Figure No.
					1:25		DS/SJ	

					Site		Trial Pit Number				
Excavation Method MECHANICAL EXCAVATOR					Dimensions 2.5m x 0.6m (approx)		Ground Level (mOD)		Client CODA STRUCTURES		
					Location AS PLAN		Dates 25/07/2019		Engineer		
									Job Number		
									Sheet 1/1		
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water			
0.30	D				(0.20)	MADE GROUND: concrete.					
					0.20						
0.50	D				(0.20)	MADE GROUND: brown cobble sized fragments of brick and stone.					
					0.40						
0.90	D					MADE GROUND: brown very sandy fine to coarse gravel sized fragments of brick, concrete and occasional metal with cloth and wood.					
					(1.40)						
1.35	D										
					1.80						
1.90	D				(0.15)	Grey coarse SAND.					
			Moderate Inflow(1) at 1.95m. 25/07/2019:		1.95	Complete at 1.95m		∇1			
Plan						Remarks					
						Moderate groundwater inflow at 1.95m Continual collapse of pit sides. On completion backfilled with arisings.					
						Scale (approx)		Logged By		Figure No.	
						1:25		DS/SJ			



Key

Groundwater Strike	Silty sandy CLAY	Gravelly SAND
Strike Rise Level	Clayey SILT	
MADE GROUND	SAND	
Silty CLAY	Silty SAND	

Nominal Section

Site MYERS BUILDERS MERCHANTS, BARR STREET, HUDDERSFIELD, WEST YORKSHIRE	Date Drawn 09/08/2019	Date Checked	Sheet 1/1	Job Number
Client CODA STRUCTURES	Drawn By	Checked By	Scale 1:20[V]	Figure No.

CoDa Structures

Consulting Civil & Structural Engineers
14 Springfield Court
GUISELEY
Leeds LS20 8FD

**PHASE 2 ENGINEERING & ENVIRONMENTAL
ASSESSMENT
FOR A PROPOSED EXTENSION AND WASTER
TRANSFER STATION AT
BARR STREET, HUDDERSFIELD**

APPENDIX F
**CABLE PERCUSSION AND
ROTARY BOREHOLE LOGS**

							Site	Borehole Number	
							MYERS BUILDING SUPPLIES, BARR STREET, HUDDERSFIELD, WEST YORKSHIRE	BH1	
Boring Method		Casing Diameter		Ground Level (mOD)		Client	Job Number		
LIGHT CABLE PERCUSSIVE		150mm to 9.00m				CODA STRUCTURES			
		Location		Dates		Engineer	Sheet		
		AS PLAN		27/08/2019			1/1		
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.30-0.50	D					(0.30)	MADE GROUND: concrete (driller's description).		
0.50-1.00	B					0.30 (0.20) 0.50	MADE GROUND: soft dark brown and occasionally orangish brown mottled slightly ashy gravelly slightly sandy silty clay. Gravel sized fragments are fine to coarse stone (hardcore).		
1.20-1.65 1.20-1.65 1.20-1.70	SPT N=4 D B			1,1/1,1,1,1		(1.40)	MADE GROUND: very soft to soft grey brown, dark brown, orangish brown and yellowish brown mottled slightly gravelly slightly sandy silty clay. Gravel sized fragments are fine to coarse stone and clinker. at 1.20m : becoming yellowish brown		▽1
2.00-2.45 2.00-2.50	D B			Water inflow(1) at 1.90m, rose to 1.60m in 20 mins, not sealed.		1.90	Medium dense yellowish brown clayey silty sandy subangular to subrounded fine to coarse sandstone GRAVEL with medium cobble content.		▽1
2.00-2.45	SPT N=16			4,3/3,4,4,5		(1.10)			
3.00-3.45 3.00-3.45 3.00-3.50	SPT N=33 D B			6,7/8,8,9,8		3.00	Dense yellowish brown slightly clayey slightly silty sandy subangular to rounded fine to coarse sandstone GRAVEL with bands of clayey silty sandy gravel and silty clay and medium cobble content.		
4.00-4.45 4.00-4.45 4.00-4.50	SPT N=37 D B			5,7/11,9,9,8					
5.50-5.95 5.50-5.95 5.50-6.00	SPT N=36 D B			6,6/8,7,11,10		(5.30)			
7.00-7.45 7.00-7.45 7.00-7.50	SPT N=33 D B			3,6/9,8,7,9					
8.50-8.73 8.50-8.75	SPT 50/80 D			15,14/50		8.30 (0.72)	Extremely weak becoming moderately strong thinly to thickly laminated black moderately to highly weathered MUDSTONE weathered to clay in places.		
9.00-9.02	SPT 25*/20 25/0			25/25 27/08/2019:		9.02	Complete at 9.02m		
Remarks Concrete cored out 250mm diameter. Hand dug inspection pit from GL to 1.20m to check for services - 1hr Chiselling from 8.50m to 9.00m - 1hr On completion backfilled with arisings.							Scale (approx)	Logged By	
							1:50	TRB/SJ	
							Figure No.		

Boring Method						Casing Diameter		Ground Level (mOD)		Site		Borehole Number	
LIGHT CABLE PERCUSSIVE						150mm to 9.00m				MYERS BUILDING SUPPLIES, BARR STREET, HUDDERSFIELD, WEST YORKSHIRE		BH2	
Location						Dates		Client		Job Number		Sheet	
AS PLAN						22/08/2019		CODA STRUCTURES		A		1/1	
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr			
0.30-0.70	B					(0.30) 0.30	MADE GROUND: concrete (driller's description).						
0.70-1.00	B					(0.40) 0.70	MADE GROUND: grey brown gravelly slightly sandy silty clay. Gravel sized fragments are fine to coarse stone, brick and concrete (hardcore).						
1.20-1.65 1.20-1.65 1.20-1.70	SPT N=3 D B			1,0/1,1,0,1		(1.20)	MADE GROUND: soft dark brown and dark grey mottled gravelly slightly sandy silty clay. Gravel sized fragments are fine to coarse stone and occasional fine concrete. ... at 1.20m : becoming yellowish brown, dark brown, dark brown, dark grey and orangish brown mottled with fine to coarse clinker		▽1				
2.00-2.45 2.00-2.50	D B			Water Inflow(1) at 1.90m, rose to 1.60m in 20 mins, sealed at 3.00m.		1.90	Medium dense dark greyish brown clayey silty sandy subangular to subrounded fine to coarse sandstone GRAVEL.		▽1				
2.00-2.45	SPT N=12			2,1/2,3,3,4		(1.50)							
3.00-3.45 3.00-3.45 3.00-3.50	SPT N=71 D B			10,10/19,14,16,22		3.40	Very dense greyish brown slightly clayey slightly silty sandy angular to subangular fine to coarse sandstone GRAVEL with high sandstone cobble content.		▽2				
4.00-4.45 4.00-4.45 4.00-4.50	SPT N=36 D B			Water Inflow(2) at 3.40m, rose to 1.50m in 20 mins, not sealed. 7,9/12,9,6,9		(0.80) 4.20	Stiff high strength yellowish brown gravelly slightly sandy silty CLAY. Gravel is subangular to subrounded fine to coarse sandstone and quartz.						
5.50-5.95 5.50-5.95 5.50-6.00	SPT N=42 D B			22,11/13,10,9,10		(1.80)	Dense orangish brown slightly silty very sandy subangular to rounded fine to coarse sandstone GRAVEL with low sandstone cobble content.						
6.30-7.00	B					6.30	Medium dense yellowish and greyish brown clayey silty sandy subangular to rounded fine to coarse sandstone GRAVEL, very clayey in places.						
7.00-7.45 7.00-7.45	SPT N=20 D			3,3/3,4,6,7		(2.20)							
8.50-8.72 8.50-8.72 8.50-9.00	SPT 50/70 D B			17,24/50		8.50 (0.51)	Extremely weak becoming moderately strong thinly to thickly laminated black to moderately highly weathered MUDSTONE weathered to clay in places.						
9.00-9.01 9.00-9.01	SPT 25/10 25/0 D			25/25 22/08/2019:		9.01	Complete at 9.01m						
Remarks Concrete cored out 250mm diameter. Hand dug inspection pit from GL to 1.20m to check for services - 1 hr Chiselling from 8.50m to 9.00m - 1hr On completion continued by R2.								Scale (approx)	1:50	Logged By	TRB/SJ		
								Figure No.					

							Site		Borehole Number		
							MYERS BUILDING SUPPLIES, BARR STREET, HUDDERSFIELD, WEST YORKSHIRE		R2		
Machine : BERETTA T44			Casing Diameter		Ground Level (mOD)		Client		Job Number		
Flush : WATER							CODA STRUCTURES				
Core Dia: NONE mm			Location		Dates		Engineer		Sheet		
Method : ROTARY OPEN HOLE			AS PLAN		23/08/2019				1/2		
Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					Open boring (100mm dia) GL to 30.00m			See Borehole BH2.			
							(9.00)				
							9.00	Moderately strong dark grey and black MUDSTONE.			
							(2.50)				
							11.50	Moderately strong grey MUDSTONE.			
							(1.00)				
							12.50 (0.40)	Moderately strong dark grey and black MUDSTONE with strong sulphur odour.			
							12.90 (0.40)				
							13.30	Moderately strong grey MUDSTONE			
								Moderately strong light grey SILTSTONE.			
								... at 14.50m : strong sulphur odour			
							(6.10)				
							19.40	Moderately strong dark grey MUDSTONE.			

Remarks
 Descriptions based upon Foreman drillers records of flush returns.
 Foreman driller recorded no voids or loss of flush returns.
 On completion backfilled with grout and risings to 6.00m and installed a 50mm dia slotted standpipe with a gas valve and a gravel surround to 5.00m, a Bentonite seal from 6.00m to 5.00m and 1.00m to 0.20m and a concreted in lockable steel protective cover from 0.20m to GL.

Scale (approx) 1:100
 Logged By DS/TRB
 Figure No.

							Site		Borehole Number			
Machine : BERETTA T44 Flush : WATER Core Dia: NONE mm Method : ROTARY OPEN HOLE							Casing Diameter		Ground Level (mOD)		Client CODA STRUCTURES	
Location AS PLAN							Dates 23/08/2019		Engineer		Job Number N12052A	
											Sheet 2/2	
Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr	
							(4.60)	Moderately strong dark grey MUDSTONE.				
					Fast Inflow(1) at 24.00m, rose to 1.10m in 20 mins.		24.00	Very strong light grey SILTSTONE.		∇1		
							(6.00)					
					23/08/2019:		30.00	Complete at 30.00m				
Remarks									Scale (approx)	Logged By		
									1:100	DS/TRB		
									Figure No.	N12052A.1.2		

							Site		Borehole Number			
Machine : BERETTA T44							Casing Diameter		Ground Level (mOD)		Client	
Flush : WATER							125mm to 8.60m				CODA STRUCTURES	
Core Dia: NONE mm							Location		Dates		Engineer	
Method : ROTARY OPEN HOLE							AS PLAN		25/07/2019		Sheet	
											1/3	
Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr	
					Open holing (100mm dia) GL to 24.00m		(0.25)	MADE GROUND: concrete.				
							(0.25)	Brown coarse SAND.				
							(0.40)	MADE GROUND: black ashy stone.				
							0.80	Soft brown and orange silty CLAY.				
							(0.70)					
							1.50	Grey coarse SAND.				
					Medium Inflow(1) at 2.00m.		(0.50)					
							2.00	Grey coarse SAND and fine to coarse GRAVEL.		Σ1		
							(3.10)					
							5.10	Grey and brown coarse SAND and fine to coarse GRAVEL.				
							(3.10)					
							8.20	Weak dark grey SHALE.				
							(1.30)					
							9.50	Moderately strong grey MUDSTONE.				

Remarks
 Descriptions based upon foreman drillers records of flush returns.
 Foreman driller recorded no voids or loss of flush returns.
 On completion backfilled with arisings from 24.00m to 10.50m and installed a Bentonite seal from 10.50m to 8.00m, backfilled with arisings from 8.00m to 5.00m and installed a 50mm dia slotted standpipe with a gas valve and a gravel surround to 5.00m, a Bentonite seal from 1.00m to 0.20m and a concreted in lockable steel protective cover from from 0.20m to GL.

Scale (approx) 1:50
 Logged By DS/SJ
 Figure No. NE

							Site		Borehole Number		
							MYERS BUILDERS MERCHANTS, BARR STREET, HUDDERSFIELD, WEST YORKSHIRE		R3		
Machine : BERETTA T44			Casing Diameter		Ground Level (mOD)		Client		Job Number		
Flush : WATER			125mm to 8.60m				CODA STRUCTURES				
Core Dia: NONE mm			Location		Dates		Engineer		Sheet		
Method : ROTARY OPEN HOLE			AS PLAN		25/07/2019				2/3		
Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
							(1.00)				
							10.50 (0.50)	Black COAL (sulphurous odour).			
							11.00	Moderately strong light grey SILTSTONE.			
							(8.30)				
							19.30 (1.10)	Black SHALE (strong sulphurous odour).			
Remarks									Scale (approx)	Logged By	
									1:50	DS/SJ	
									Figure No.		

							Site		Borehole Number					
Machine : BERETTA T44 Flush : WATER Core Dia: NONE mm Method : ROTARY OPEN HOLE							Casing Diameter 125mm to 8.60m		Ground Level (mOD)		Client CODA STRUCTURES		Job Number	
							Location AS PLAN		Dates 25/07/2019		Engineer		Sheet 3/3	
Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr			
							20.40	Dark grey MUDSTONE.						
							(3.60)							
					25/07/2019:		24.00	Complete at 24.00m						

Remarks

Scale (approx)

1:50

Logged By

DS/SJ

Figure No.

							Site		Borehole Number	
							MYERS BUILDING SUPPLIES, BARR STREET, HUDDERSFIELD, WEST YORKSHIRE		BH4	
Boring Method		Casing Diameter		Ground Level (mOD)		Client		Job Number		
LIGHT CABLE PERCUSSIVE		150mm to 6.00m				CODA STRUCTURES				
		Location		Dates		Engineer		Sheet		
		AS PLAN		21/08/2019				1/1		
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.30	B					(0.30) 0.30	MADE GROUND: concrete (driller's description).			
						(0.80)	MADE GROUND: soft brown gravelly slightly sandy silty clay with fishy odour. Gravel sized fragments are fine to coarse stone, concrete and brick (hardcore).			
1.20-1.65 1.20-1.65 1.20-1.65 1.20-1.70	SPT N=4 B D U			1,1/1,1,1,1		1.10 (0.90)	MADE GROUND: soft yellowish brown, light grey, orangish brown and dark grey mottled gravelly slightly sandy silty clay. Gravel sized fragments are fine to coarse stone and clinker.			
						2.00 (0.80)	Soft yellowish greyish brown slightly gravelly slightly sandy silty CLAY. Gravel is subangular to subrounded fine to coarse sandstone.		▼ ▼	
3.00-3.45 3.00-3.50 3.00-3.45	D B SPT N=35			Water Inflow(1) at 2.80m, rose to 2.00m in 20 mins, sealed at 3.20m. 8,9/8,9,8,10		2.80 (0.40) 3.20	Dense dark brown and greyish brown mottled clayey silty sandy subangular fine to coarse sandstone GRAVEL.		▼ ▼	
						(0.80)	Greyish brown and occasional cream mottled gravelly slightly sandy silty CLAY with low sandstone cobble content. Gravel is subangular to subrounded fine to coarse sandstone.			
4.00 4.00-4.45 4.00-4.50	W D B			Water Inflow(2) at 4.00m, rose to 2.30m in 20 mins, sealed at 4.90m. 2,4/4,5,5,5		4.00 (0.90)	Medium dense greyish brown clayey silty sandy subangular to subrounded fine to coarse sandstone GRAVEL with high cobble content.		▼ ▼	
4.00-4.45	SPT N=19					4.90 (1.10)	Stiff high strength dark grey slightly gravelly slightly sandy silty CLAY with low sandstone cobble content. Gravel is subangular to rounded fine to coarse sandstone and mudstone.		▼ ▼	
5.00-5.45 5.00-5.45 5.00-5.50	SPT N=27 D B			4,5/5,7,8,7		6.00 (1.42)	Extremely weak becoming moderately strong thinly to thickly laminated black moderately to highly weathered MUDSTONE weathered to clay in places.			
6.50-6.77 6.50-6.77 6.50-6.95	SPT 45/115 D B			6,14/45		7.30-7.42 7.40-7.42	Complete at 7.42m			

Remarks Concrete cored out 250mm diameter. Hand dug inspection pit from GL to 1.20m to check for services - 1hr Chiselling from 6.50m to 7.30m - 30mins On completion backfilled with arisings and installed a 50mm slotted standpipe with a gas valve and a gravel surround to 5.00m, a Bentonite seal from 1.00m to 0.20m and a concreted in lockable steel protective cover from 0.20m to GL.	Scale (approx)	Logged By
	1:50	TRB/SJ
	Figure No.	

							Site		Borehole Number			
Machine : BERETTA T44 Flush : WATER Core Dia: NONE mm Method : ROTARY OPEN HOLE							Casing Diameter		Ground Level (mOD)		Client CODA STRUCTURES	
Location AS PLAN							Dates 23/06/2019		Engineer		Job Number	
											Sheet 1/2	
Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr	
					Open holing (100m dia) GL to 30.00m		(7.00)	See Borehole BH4.				
							7.00	Moderately strong grey MUDSTONE.				
							(2.60)					
					Fast Inflow(1) at 9.60m, rose to 1.75m in 20 mins.		9.60	Dark grey MUDSTONE.				
							9.80 (0.50)	Intact COAL.				
							10.30	Strong light grey SILTSTONE.				
							(6.70)					
							17.00	Moderately strong grey MUDSTONE.				
							(4.00)					
Remarks Descriptions based upon Foreman drillers records of flush returns. Foreman driller recorded no voids or loss of flush returns. On completion backfilled with arisings from 30.00m to 23.00m and installed a Bentonite seal from 23.00m to 21.00m, backfilled with arisings from 21.00m to 5.00m and installed a a 50mm dia slotted standpipe with a gas valve and a gravel surround to 5.00m, a Bentonite seal from 1.00m to 0.20m and a concreted in lockable steel protective cover from from 0.20m to GL.									Scale (approx)	Logged By		
									1:100	DS/SJ		
									Figure No.			

							Site		Borehole Number		
Machine : BERETTA T44			Casing Diameter		Ground Level (mOD)		MYERS BUILDING SUPPLIES, BARR STREET, HUDDERSFIELD, WEST YORKSHIRE		R4		
Flush : WATER							Client		Job Number		
Core Dia: NONE mm							CODA STRUCTURES				
Method : ROTARY OPEN HOLE			Location		Dates		Engineer		Sheet		
			AS PLAN		23/08/2019				2/2		
Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
								Moderately strong grey MUDSTONE.			
							21.00 (1.00)	Dark grey MUDSTONE/SILTSTONE.			
							22.00 (0.30)	Intact COAL, with strong sulphur odour.			
							22.30 (0.30)	Moderately strong grey MUDSTONE.			
							22.60	Very strong grey SILTSTONE.			
							(5.50)				
							28.10	Moderately strong grey MUDSTONE.			
							(1.90)				
					23/08/2019:		30.00	Complete at 30.00m			
Remarks									Scale (approx)	Logged By	
									1:100	DS/SJ	
									Figure No.		

							Site	Borehole Number		
							MYERS BUILDING SUPPLIES, BARR STREET, HUDDERSFIELD, WEST YORKSHIRE	BH5		
Boring Method		Casing Diameter		Ground Level (mOD)		Client	Job Number			
LIGHT CABLE PERCUSSIVE		150mm to 9.00m				CODA STRUCTURES	1/1			
		Location		Dates		Engineer	Sheet			
		AS PLAN		28/08/2019			1/1			
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (Thickness) (m)	Description	Legend	Water	Instr
0.30-1.00	B					(0.30) 0.30	MADE GROUND: concrete (driller's description).			
						(1.70)	MADE GROUND: soft yellowish brownish grey gravelly slightly sandy silty clay with hydrocarbon odour. Gravel sized fragments are fine to coarse stone and clinker.			
1.20-1.85 1.20-1.85 1.20-1.70	SPT N=4 D B			1,0/1,1,1,1		2.00	Soft low strength yellowish brown and occasional dark grey and greyish brown mottled slightly gravelly slightly sandy silty CLAY. Gravel sized fragments are subangular to subrounded fine to coarse sandstone.			
2.00-2.45 2.00-2.45 2.00-2.50	SPT N=5 D B			1,2/1,2,1,1		(1.80)				
3.00-3.45 3.00-3.45 3.00-3.50	SPT N=5 D B			2,2/1,1,2,1		3.80	Dense dark grey brown slightly clayey locally clayey slightly silty sandy subangular to subrounded fine to coarse sandstone GRAVEL with low sandstone cobble content.			
4.00-4.45 4.00-4.50 4.00-4.45	D B SPT N=43			Water Inflow(1) at 3.80m, rose to 1.60m in 20 mins, not sealed. 6,7/9,13,11,10		(4.60)				
5.50-5.95 5.50-5.95 5.60	SPT N=35 D W			8,6/7,7,9,12		8.40				
6.50-6.00	B					(0.62)	Very weak thinly to thickly laminated black moderately to highly weathered MUDSTONE and occasionally weathered to clay in places.			
7.00-7.45 7.00-7.45 7.00-7.50	SPT N=42 D B			9,6/11,9,12,10		9.02	Complete at 9.02m			
8.50-8.68 8.50-8.95 8.50-9.00	SPT 50/25 D B			12,18/50						
9.00-9.02	SPT(C) 25*/10 25/10			25/25 28/08/2019:						

Remarks

Concrete cored out 250mm diameter.
Chiselling from 8.40m to 9.00m - 1hr
On completion backfilled with arisings and installed a 50mm dia slotted standpipe with a gas valve and a gravel surround to 5.00m, a Bentonite seal from 1.00m to 0.20m and a concreted in lockable steel protective cover from 0.20m to GL.
Hand dug inspection pit from GL to 1.20m to check for services - 1hr

Scale (approx)

1:50

Logged By

TRB/SJ

Figure No.

							Site	Borehole Number	
Boring Method		Casing Diameter		Ground Level (mOD)		Client	Job Number		
LIGHT CABLE PERCUSSIVE		150mm to 8.00m				CODA STRUCTURES			
		Location		Dates		Engineer	Sheet		
		AS PLAN		20/08/2019			1/1		
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.30	D					(0.30)	MADE GROUND: reinforced concrete (driller's description).		
0.60	D					0.30			
0.80	D					(0.30)	MADE GROUND: soft brown and grey mottled slightly gravelly slightly sandy silty clay. Gravel sized fragments are fine stone.		
0.90	D					0.60			
1.00-1.45	SPT N=4			3,2/1,1,1,1		(0.30)	MADE GROUND: soft dark brown, dark grey and occasional orangish brown mottled slightly gravelly slightly sandy silty clay with plant remains and occasional rootlets. Gravel sized fragments are fine to coarse stone, clinker and brick.		
1.00-1.45	D					(1.10)			▽3
1.00-1.50	B					2.00	MADE GROUND: soft yellowish brown, dark grey and occasional orangish brown mottled slightly gravelly slightly sandy silty clay. Gravel is fine to coarse stone and clinker.		▽2
2.00-2.45	SPT N=0			2,3/0,0,0,0		2.00			
2.00-2.45	D					(0.80)	Very soft extremely low strength yellowish brown and occasionally dark brown mottled slightly gravelly slightly sandy silty CLAY. Gravel is subangular fine to coarse sandstone.		▽1
2.00-2.50	B					2.80			
2.80	D			Water Inflow(1) at 2.80m, rose to 2.40m in 20 mins. 2,8/5,7,4,4		2.80	Medium dense dark greyish brown clayey locally very clayey silty sandy subangular to rounded fine to coarse sandstone GRAVEL.		▽1
3.00-3.45	D					(2.20)			
3.00-3.45	SPT N=20			2,3/5,3,3,5		5.00			▽2
3.00-3.50	B					(1.00)	Medium dense dark greyish brown slightly clayey slightly silty sandy locally very sandy subangular to rounded fine to coarse sandstone GRAVEL with low sandstone cobble content.		
4.00-4.45	SPT N=16			2,3/11,3,5,4		6.00			▽2
4.00-4.45	D					(0.60)	Firm high strength dark greyish brown slightly gravelly slightly sandy silty CLAY. Gravel is subangular fine to coarse sandstone.		
4.00-4.50	B					6.60			▽3
5.00-5.45	D			Water Inflow(2) at 5.00m, rose to 1.90m in 20 mins. 2,3/2,3,3,4		6.60	Medium dense dark greyish brown slightly clayey locally clayey silty sandy subangular to rounded fine to coarse sandstone GRAVEL with low sandstone cobble content.		
5.00-5.50	B					(1.20)			
5.00-5.45	SPT N=12			2,1/3,5,4,4		7.80			
6.00-6.45	SPT N=23			13,22/50		(1.25)	Extremely weak becoming moderately strong thinly to thickly laminated black moderately to highly weathered MUDSTONE completely weathered to clay in places.		
6.00	D					9.05			
6.00-6.45	D								
6.00-6.50	B								
7.00-7.45	SPT N=16			33/50					
7.00-7.45	D			28/08/2019:1.10m					
7.00-7.50	B								
7.80	D								
8.00-8.23	SPT 50/75								
8.00-8.23	D								
8.90-9.05	SPT 33*/75								
8.90-9.05	50/75								
8.90-9.05	D						Complete at 9.05m		

Remarks

Concrete cored out 250mm diameter
 Hand dug inspection pit from GL to 1.20m to check for services - 1hr
 Chiselling from 8.60m to 8.90m - 1hr
 On completion backfilled with arisings.

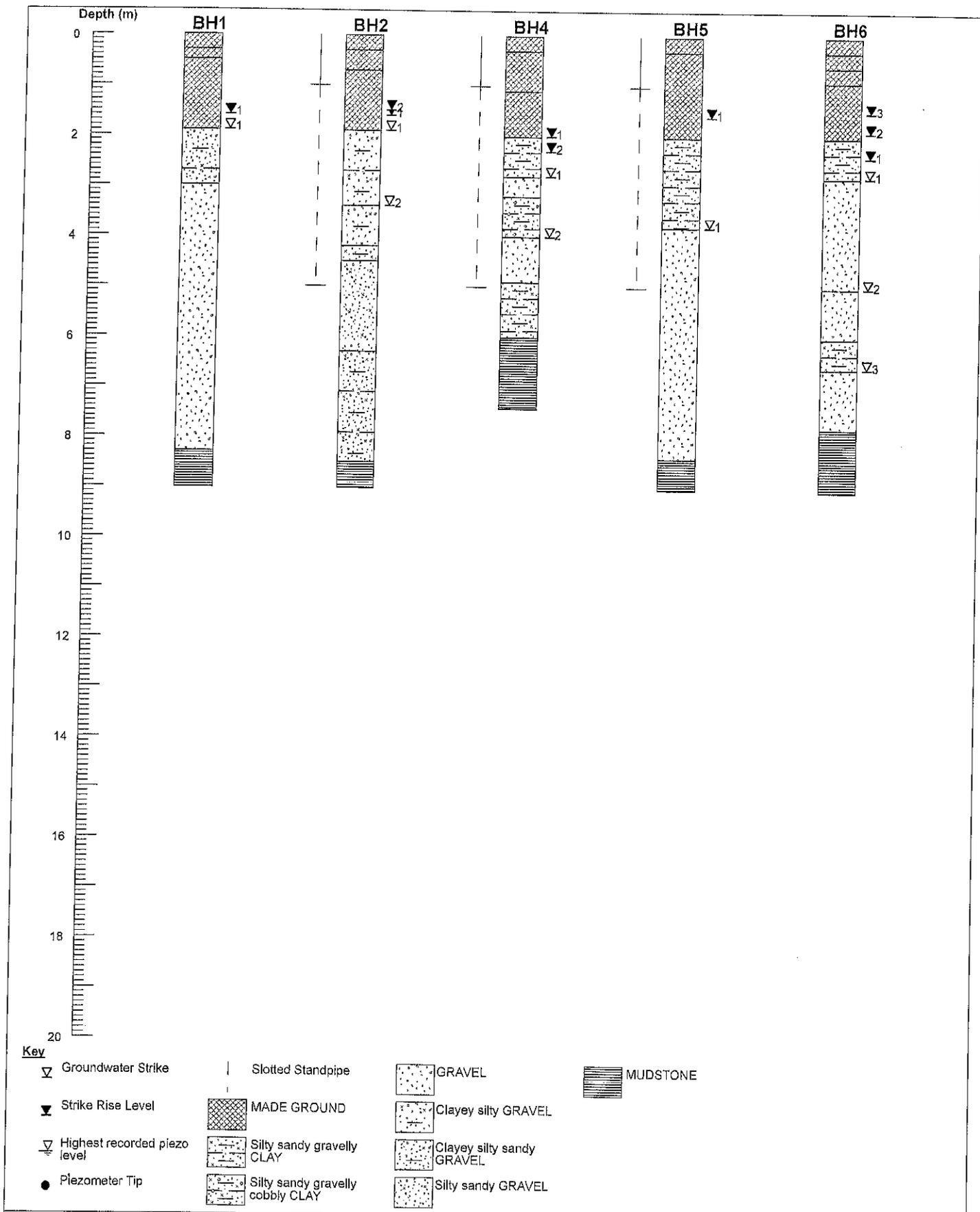
Scale (approx)

1:50

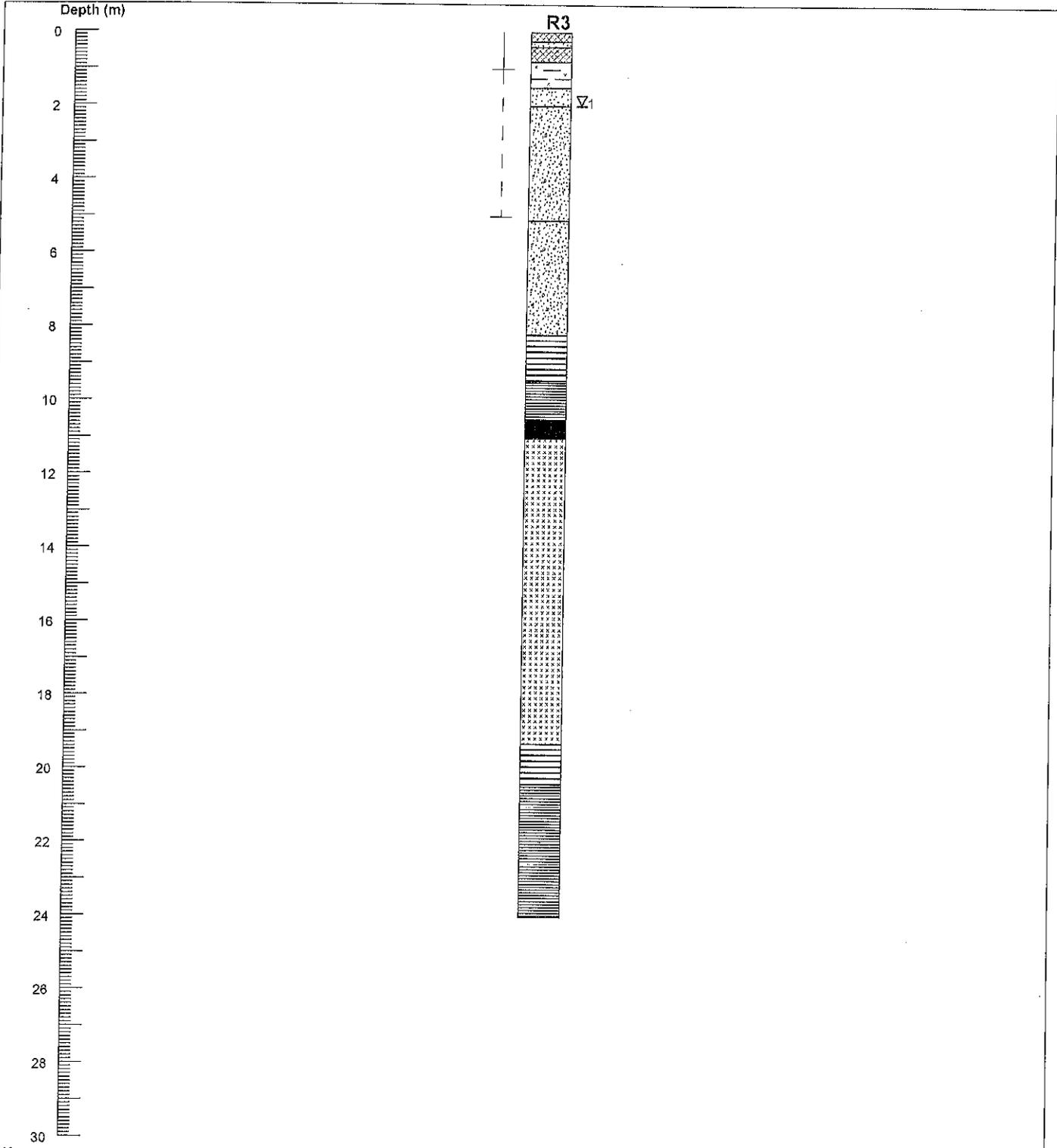
Logged By

TRB/SJ

Figure No.



Nominal Section				
Site MYERS BUILDING SUPPLIES, BARR STREET, HUDDERSFIELD, WEST YORKSHIRE	Date Drawn 20/09/2019	Date Checked	Sheet 1/1	Job Number
Client CODA STRUCTURES	Drawn By	Checked By	Scale 1:100[V]	Figure No.

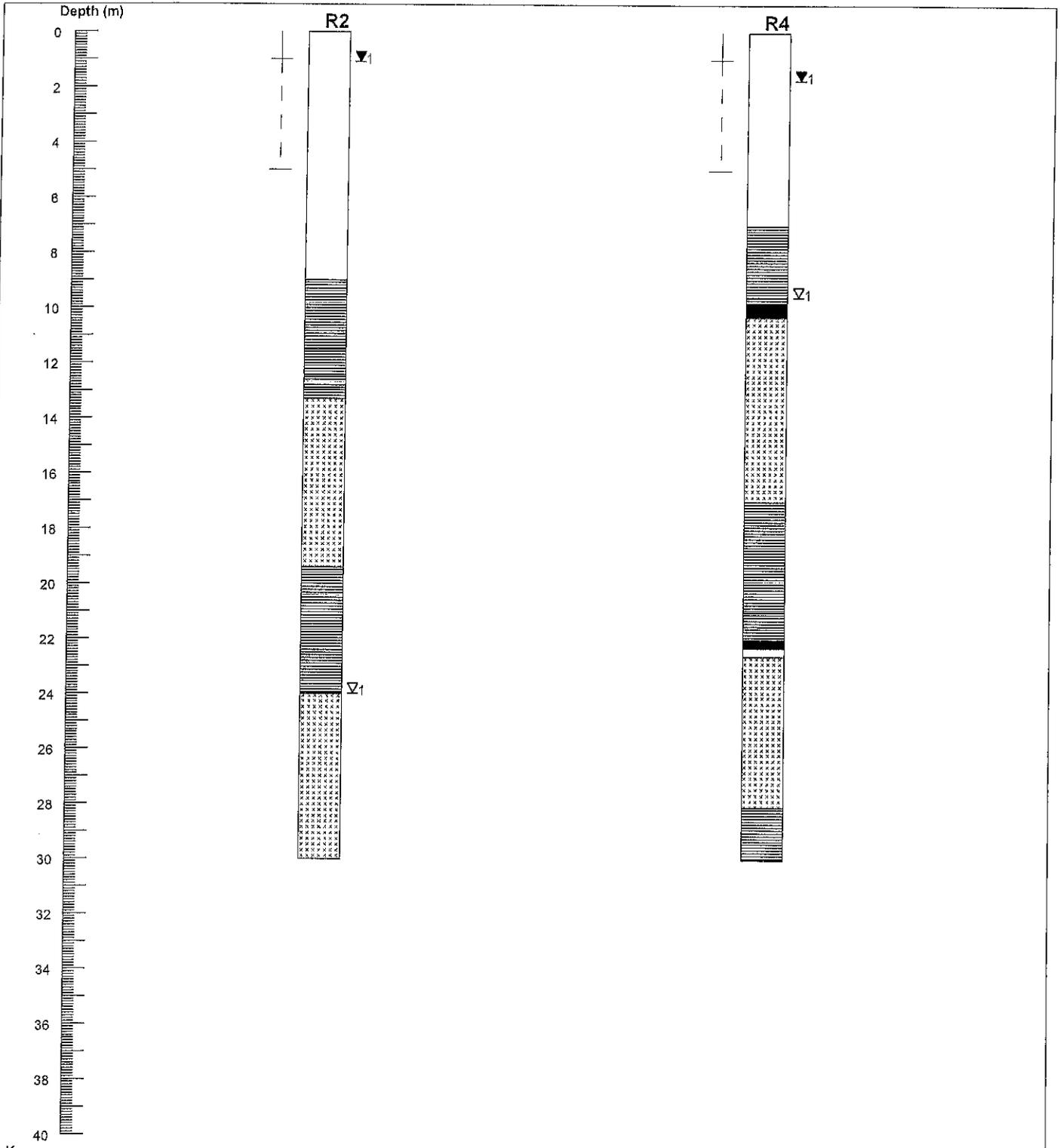


Key

▽ Groundwater Strike	Slotted Standpipe	SAND and GRAVEL	Shale
▽ Strike Rise Level	MADE GROUND	MUDSTONE	
▽ Highest recorded piezo level	Silty CLAY	SILTSTONE	
● Piezometer Tip	SAND	COAL	

Nominal Section

Site MYERS BUILDERS MERCHANTS, BARR STREET, HUDDERSFIELD, WEST YORKSHIRE	Date Drawn 09/08/2019	Date Checked	Sheet 1/1	Job Number
Client CODA STRUCTURES	Drawn By	Checked By	Scale 1:150[V]	Figure No.



Key

▽	Groundwater Strike		Slotted Standpipe	□
▽	Strike Rise Level	▨	MUDSTONE	
▽	Highest recorded piezo level	▩	SILTSTONE	
●	Piezometer Tip	■	COAL	

Nominal Section				
Site MYERS BUILDING SUPPLIES, BARR STREET, HUDDERSFIELD, WEST YORKSHIRE	Date Drawn 20/09/2019	Date Checked	Sheet 1/1	Job Number 11705-000
Client CODA STRUCTURES	Drawn By	Checked By	Scale 1:200[V]	Figure No. 11705-000

CoDa Structures

Consulting Civil & Structural Engineers
14 Springfield Court
GUISELEY
Leeds LS20 8FD

**PHASE 2 ENGINEERING & ENVIRONMENTAL
ASSESSMENT
FOR A PROPOSED EXTENSION AND WASTER
TRANSFER STATION AT
BARR STREET, HUDDERSFIELD**

APPENDIX G

CHEMICAL TEST RESULTS



CONCEPT LIFE SCIENCES
DELIVERING SCIENCE

Concept Life Sciences is a trading name of
Concept Life Sciences Analytical & Development
Services Limited registered in England and
Wales (No 2514788)

Concept Life Sciences

Certificate of Analysis

Hadfield House
Hadfield Street
Combrook
Manchester
M16 9FE
Tel : 0161 874 2400
Fax : 0161 874 2468

Report Number: 839335-2

Date of Report: 15-Aug-2019

Customer: Coda Structures
14 Springfield Court
Guiseley
Leeds
LS20 8FD

Customer Contact: Mr Jon Lawrence

Customer Job Reference: 7916

Customer Site Reference: Barr St, Huddersfield

Date Job Received at Concept: 08-Aug-2019

Date Analysis Started: 09-Aug-2019

Date Analysis Completed: 15-Aug-2019

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.

Customers are responsible for information provided where, if incorrect, it could affect the validity of the results.

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

This report should not be reproduced except in full without the written approval of the laboratory

Tests covered by this certificate were conducted in accordance with Concept Life Sciences SOPs

All results have been reviewed in accordance with QMSection 15 of the Concept Life Sciences, Analytical Services Quality Manual



Report checked
and authorised by :
Ms Jeanette Abbott
Customer Services Manager

Issued by :
Ms Jeanette Abbott
Customer Services Manager

<p>Concept Reference: 839335 Project Site: Barr St, Huddersfield Customer Reference: 7916</p> <p>Soil Analysed as Soil MCERTS Preparation</p>									
Concept Reference		839335 001	839335 002	839335 003	839335 004	839335 005			
Customer Sample Reference		TP1 111	TP1 113	TP2 141	TP2 143	TP4 128			
Date Sampled		Deviating	Deviating	Deviating	Deviating	Deviating			
Matrix Class		Topsoil	Topsoil	Sandy Soil	Sandy Soil	Topsoil			
Determinand	Method	Test Sample	LOD	Units					
Moisture @105C	T162	AR	0.1	%	8.4	30	21	21	24
Retained on 10mm sieve	T2	M40	0.1	%	<0.1	<0.1	<0.1	<0.1	<0.1

<p>Concept Reference: 839335 Project Site: Barr St, Huddersfield Customer Reference: 7916</p> <p>Soil Analysed as Soil MCERTS Preparation</p>									
Concept Reference		839335 006	839335 007	839335 008	839335 009				
Customer Sample Reference		TP4 129	TP4 131	TP6 119	TP6 121				
Date Sampled		Deviating	Deviating	Deviating	Deviating				
Matrix Class		Sandy Soil	Sandy Soil	Sandy Soil	Sandy Soil				
Determinand	Method	Test Sample	LOD	Units					
Moisture @105C	T162	AR	0.1	%	26	19	11	17	
Retained on 10mm sieve	T2	M40	0.1	%	<0.1	<0.1	<0.1	<0.1	

<p>Concept Reference: 839335 Project Site: Barr St, Huddersfield Customer Reference: 7916</p> <p>Soil Analysed as Soil Misc</p>											
Concept Reference		839335 001		839335 002		839335 003		839335 004		839335 005	
Customer Sample Reference		TP1 111		TP1 113		TP2 141		TP2 143		TP4 128	
Date Sampled		Deviating		Deviating		Deviating		Deviating		Deviating	
Matrix Class		Topsoil		Topsoil		Sandy Soil		Sandy Soil		Topsoil	
Determinand	Method	Test Sample	LOD	Units							
pH	T7	A40			8.7	7.2	8.1	7.8	7.6		
SO4(2:1)	T6	AR	0.1	g/l	<0.1	<0.1	<0.1	<0.1	<0.1		
Boron (water-soluble)	T6	A40	1	mg/kg	<1	<1	-	-	<1		
Phenols(Mono)	T546	AR	1	mg/kg	<1	<1	-	-	<1		

<p>Concept Reference: 839335 Project Site: Barr St, Huddersfield Customer Reference: 7916</p> <p>Soil Analysed as Soil Misc</p>											
Concept Reference		839335 006		839335 007		839335 008		839335 009			
Customer Sample Reference		TP4 129		TP4 131		TP6 119		TP6 121			
Date Sampled		Deviating		Deviating		Deviating		Deviating			
Matrix Class		Sandy Soil		Sandy Soil		Sandy Soil		Sandy Soil			
Determinand	Method	Test Sample	LOD	Units							
pH	T7	A40			6.7	7.0	8.3	8.4			
SO4(2:1)	T6	AR	0.1	g/l	<0.1	<0.1	0.1	<0.1			
Boron (water-soluble)	T6	A40	1	mg/kg	-	-	<1	<1			
Asbestos	T27	AR			-	-	Amosite Loose Fibres Detected	-			
							Chrysotile ACM Detected				
Phenols(Mono)	T546	AR	1	mg/kg	-	-	<1	<1			

Concept Reference: 839335									
Project Site: Barr St, Huddersfield									
Customer Reference: 7916									
Soil Metals Suite									
Analysed as Soil									
Concept Reference		839335 001	839335 002	839335 005	839335 008	839335 009			
Customer Sample Reference		TP1 111	TP1 113	TP4 128	TP6 119	TP6 121			
Date Sampled		Deviating	Deviating	Deviating	Deviating	Deviating			
Matrix Class		Topsoil	Topsoil	Topsoil	Sandy Soil	Sandy Soil			
Determinand	Method	Test Sample	LOD	Units					
Arsenic	T6	M40	2	mg/kg	7	7	30	34	45
Cadmium	T6	M40	1	mg/kg	<1	1	<1	<1	<1
Chromium	T6	M40	1	mg/kg	45	28	27	51	50
Copper	T6	M40	1	mg/kg	68	24	54	140	100
Lead	T6	M40	1	mg/kg	90	75	150	410	310
Mercury	T6	M40	1	mg/kg	<1	<1	<1	<1	<1
Nickel	T6	M40	1	mg/kg	35	26	30	37	39
Selenium	T6	M40	3	mg/kg	<3	<3	<3	<3	<3
Zinc	T6	M40	1	mg/kg	100	120	110	320	290

Concept Reference: 839335									
Project Site: Barr St, Huddersfield									
Customer Reference: 7916									
Soil PAH US EPA 16 (B and K split)									
Analysed as Soil									
Concept Reference		839335 001	839335 002	839335 005	839335 008	839335 009			
Customer Sample Reference		TP1 111	TP1 113	TP4 128	TP6 119	TP6 121			
Date Sampled		Deviating	Deviating	Deviating	Deviating	Deviating			
Matrix Class		Topsoil	Topsoil	Topsoil	Sandy Soil	Sandy Soil			
Determinand	Method	Test Sample	LOD	Units					
Naphthalene	T207	M105	0.1	mg/kg	2.0	<0.1	<0.1	0.3	0.2
Acenaphthylene	T207	M105	0.1	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	T207	M105	0.1	mg/kg	1.8	<0.1	<0.1	0.1	<0.1
Fluorene	T207	M105	0.1	mg/kg	1.3	<0.1	<0.1	<0.1	<0.1
Phenanthrene	T207	M105	0.1	mg/kg	11	0.2	0.5	1.4	0.9
Anthracene	T207	M105	0.1	mg/kg	3.0	<0.1	0.1	0.2	0.2
Fluoranthene	T207	M105	0.1	mg/kg	15	0.3	0.8	2.1	1.3
Pyrene	T207	M105	0.1	mg/kg	13	0.3	0.8	1.9	1.1
Benzo(a)Anthracene	T207	M105	0.1	mg/kg	6.0	0.1	0.4	1.1	0.6
Chrysene	T207	M105	0.1	mg/kg	5.9	0.1	0.4	1.3	0.8
Benzo(b)fluoranthene	T207	M105	0.1	mg/kg	5.1	<0.1	0.2	1.1	0.5
Benzo(k)fluoranthene	T207	M105	0.1	mg/kg	5.1 ⁽⁶⁸⁾	0.1 ⁽⁶⁸⁾	0.3 ⁽⁶⁸⁾	1.0 ⁽⁶⁸⁾	0.6 ⁽⁶⁸⁾
Benzo(a)Pyrene	T207	M105	0.1	mg/kg	6.7	0.1	0.3	1.2	0.6
Indeno(123-cd)Pyrene	T207	M105	0.1	mg/kg	3.5	0.4	0.2	0.6	0.4
Dibenzo(ah)Anthracene	T207	M105	0.1	mg/kg	1.2	0.2	<0.1	0.2	0.1
Benzo(ghi)Perylene	T207	M105	0.1	mg/kg	3.7	0.8	0.3	0.7	0.4
PAH(total)	T207	M105	0.1	mg/kg	84	2.7	4.4	13	7.8

Index to symbols used in 839335-2

Value	Description
M105	Analysis conducted on an "as received" aliquot. Results are reported on a dry weight basis where moisture content was determined by assisted drying of sample at 105C
AR	As Received
A40	Assisted dried < 40C
M40	Analysis conducted on sample assisted dried at no more than 40C. Results are reported on a dry weight basis.
68	Outside scope of UKAS accreditation
S	Analysis was subcontracted
M	Analysis is MCERTS accredited
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Notes

Asbestos was subcontracted to REC Asbestos.

PAH (MCERTS) was performed at Concept Life Sciences - Braintree

The date of sampling has not been provided and therefore the time from sampling to analysis is unknown. It is possible therefore that the results provided may be compromised.

Method Index

Value	Description
T2	Grav
T6	ICP/OES
T546	Colorimetry (CF)
T162	Grav (1 Dec) (105 C)
T207	GC/MS (MCERTS)
T27	PLM
T7	Probe

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Moisture @105C	T162	AR	0.1	%	N	001-009
Retained on 10mm sieve	T2	M40	0.1	%	N	001-009
pH	T7	A40			M	001-009
SO4(2:1)	T6	AR	0.1	g/l	N	001-009
Boron (water-soluble)	T6	A40	1	mg/kg	N	001-002,005,008-009
Asbestos	T27	AR			SU	006
Phenols(Mono)	T546	AR	1	mg/kg	M	001-002,005,008-009
Arsenic	T6	M40	2	mg/kg	M	001-002,005,008-009
Cadmium	T6	M40	1	mg/kg	M	001-002,005,008-009
Chromium	T6	M40	1	mg/kg	M	001-002,005,008-009
Copper	T6	M40	1	mg/kg	M	001-002,005,008-009
Lead	T6	M40	1	mg/kg	M	001-002,005,008-009
Mercury	T6	M40	1	mg/kg	M	001-002,005,008-009
Nickel	T6	M40	1	mg/kg	M	001-002,005,008-009
Selenium	T6	M40	3	mg/kg	M	001-002,005,008-009
Zinc	T6	M40	1	mg/kg	M	001-002,005,008-009
Naphthalene	T207	M105	0.1	mg/kg	M	001-002,005,008-009
Acenaphthylene	T207	M105	0.1	mg/kg	U	001-002,005,008-009
Acenaphthene	T207	M105	0.1	mg/kg	M	001-002,005,008-009
Fluorene	T207	M105	0.1	mg/kg	M	001-002,005,008-009
Phenanthrene	T207	M105	0.1	mg/kg	M	001-002,005,008-009
Anthracene	T207	M105	0.1	mg/kg	U	001-002,005,008-009
Fluoranthene	T207	M105	0.1	mg/kg	M	001-002,005,008-009
Pyrene	T207	M105	0.1	mg/kg	M	001-002,005,008-009
Benzo(a)Anthracene	T207	M105	0.1	mg/kg	M	001-002,005,008-009
Chrysene	T207	M105	0.1	mg/kg	M	001-002,005,008-009
Benzo(b)fluoranthene	T207	M105	0.1	mg/kg	M	001-002,005,008-009
Benzo(k)fluoranthene	T207	M105	0.1	mg/kg	M	001-002,005,008-009
Benzo(a)Pyrene	T207	M105	0.1	mg/kg	M	001-002,005,008-009
Indeno(123-cd)Pyrene	T207	M105	0.1	mg/kg	M	001-002,005,008-009
Dibenzo(ah)Anthracene	T207	M105	0.1	mg/kg	M	001-002,005,008-009
Benzo(ghi)Perylene	T207	M105	0.1	mg/kg	M	001-002,005,008-009
PAH(total)	T207	M105	0.1	mg/kg	U	001-002,005,008-009



Final Report

Report No.: 19-32034-1

Initial Date of Issue: 01-Oct-2019

Client: Sub Surface

Client Address: 3 Peel Street
Preston
Lancashire
PR2 2QS

Contact(s): Simon Gabbatt

Project: NE3852B Barr Street, Huddersfield

Quotation No.: **Date Received:** 25-Sep-2019

Order No.: **Date Instructed:** 25-Sep-2019

No. of Samples: 15

Turnaround (Wkdays): 5 **Results Due:** 01-Oct-2019

Date Approved: 01-Oct-2019

Approved By:

redacted

Details: Amy Parekh-Pross, Technical Projects
Manager

Results - Soil

Quotation No.:	Client: Sub Surface		Chemtest Job No.:		19-32034		19-32034		19-32034		19-32034		19-32034		19-32034	
	Chemtest Sample ID.:	Client Sample ID.:	894313	894314	894315	894316	894317	894318	894319	894320	894320	894320	894320	894320	894320	894320
Sample Location:	Sample Type:	Top Depth (m):	Bottom Depth (m):	Date Sampled (\$):	Asbestos Lab:											
Determinand	Assted	SOP	Units	LOD	Asbestos Lab:											
ACM Type	U	2192		N/A	-	-	-	-	-	-	-	-	-	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected											
ACM Detection Stage	U	2192		N/A	-	-	-	-	-	-	-	-	-	-	-	-
Moisture	N	2030	%	0.020	13	17	13	10	13	29	13	10	29	13	29	18
pH	U	2010		N/A	[B] 8.0	[B] 8.0	[B] 7.7	[B] 8.6	[B] 11.2	[B] 8.7	[B] 7.1	[B] 8.7	[B] 8.7	[B] 7.1	[B] 7.1	[B] 7.1
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40	0.59	0.46	0.048	0.46	0.77	0.96		0.46	0.96			
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.10	0.17	0.034	0.048	0.065	0.89	0.38	0.14	0.065	0.38	0.14	0.14	0.14
Arsenic	U	2450	mg/kg	1.0	16			11	19	16		11	16			
Cadmium	U	2450	mg/kg	0.10	1.0			0.43	0.30	0.24		0.43	0.24			
Chromium	U	2450	mg/kg	1.0	16			15	17	32		15	32			
Copper	U	2450	mg/kg	0.50	33			77	12	29		77	29			
Mercury	U	2450	mg/kg	0.10	0.10			< 0.10	< 0.10	< 0.10		< 0.10	< 0.10			
Nickel	U	2450	mg/kg	0.50	18			14	14	24		14	24			
Lead	U	2450	mg/kg	0.50	58			110	17	31		110	31			
Selenium	U	2450	mg/kg	0.20	0.26			< 0.20	< 0.20	0.29		< 0.20	0.29			
Zinc	U	2450	mg/kg	0.50	120			160	44	110		160	110			
Naphthalene	U	2700	mg/kg	0.10	[B] 2.4			[B] 0.41	[B] < 0.10	[B] 0.61		[B] 0.41	[B] 0.61			
Acenaphthylene	U	2700	mg/kg	0.10	[B] 0.78			[B] 0.18	[B] < 0.10	[B] 0.25		[B] 0.18	[B] 0.25			
Acenaphthene	U	2700	mg/kg	0.10	[B] 2.8			[B] 0.35	[B] < 0.10	[B] 0.28		[B] 0.35	[B] 0.28			
Fluorene	U	2700	mg/kg	0.10	[B] 3.3			[B] 0.28	[B] < 0.10	[B] 0.35		[B] 0.28	[B] 0.35			
Phenanthrene	U	2700	mg/kg	0.10	[B] 26			[B] 3.0	[B] 1.6	[B] 1.6		[B] 3.0	[B] 1.6			
Anthracene	U	2700	mg/kg	0.10	[B] 5.6			[B] 0.50	[B] 0.53	[B] 0.42		[B] 0.50	[B] 0.42			
Fluoranthene	U	2700	mg/kg	0.10	[B] 31			[B] 4.1	[B] 2.3	[B] 2.3		[B] 4.1	[B] 2.3			
Pyrene	U	2700	mg/kg	0.10	[B] 30			[B] 4.2	[B] 2.2	[B] 2.0		[B] 4.2	[B] 2.0			
Benzo[a]anthracene	U	2700	mg/kg	0.10	[B] 13			[B] 1.9	[B] 1.0	[B] 0.67		[B] 1.9	[B] 0.67			
Chrysene	U	2700	mg/kg	0.10	[B] 15			[B] 2.0	[B] 0.90	[B] 1.1		[B] 2.0	[B] 0.90			
Benzo[b]fluoranthene	U	2700	mg/kg	0.10	[B] 15			[B] 2.7	[B] 1.3	[B] 0.76		[B] 2.7	[B] 0.76			
Benzo[k]fluoranthene	U	2700	mg/kg	0.10	[B] 6.1			[B] 1.2	[B] 0.68	[B] 0.37		[B] 1.2	[B] 0.37			
Benzo[a]pyrene	U	2700	mg/kg	0.10	[B] 13			[B] 1.8	[B] 0.87	[B] 0.47		[B] 1.8	[B] 0.47			
Indeno(1,2,3-c,d)Pyrene	U	2700	mg/kg	0.10	[B] 6.9			[B] 1.5	[B] 0.68	[B] 0.10		[B] 1.5	[B] 0.10			
Dibenz[a,h]Anthracene	U	2700	mg/kg	0.10	[B] 1.9			[B] 0.27	[B] 0.20	[B] < 0.10		[B] 0.27	[B] < 0.10			
Benzo[g,h,i]perylene	U	2700	mg/kg	0.10	[B] 7.2			[B] 1.2	[B] 0.60	[B] 0.60		[B] 1.2	[B] 0.60			
Total Of 16 PAH's	U	2700	mg/kg	2.0	[B] 180			[B] 26	[B] 13	[B] 12		[B] 26	[B] 12			
Total Phenols	U	2920	mg/kg	0.30	< 0.30			< 0.30	< 0.30	< 0.30		< 0.30	< 0.30			

Results - Soil

Client: Sub Surface	Chemtest Job No.		19-32034		19-32034		19-32034		19-32034		19-32034	
	Quotation No.:	Chemtest Sample ID.:	Client Sample ID.:	Sample Location:	Sample Type:	Top Depth (m):	Bottom Depth (m):	Date Sampled (\$):	Asbestos Lab:	Asbestos Lab:	Asbestos Lab:	Asbestos Lab:
	894321	894322	894323	894324	894325	894326	894327	22-Aug-2019	DURHAM	22-Aug-2019	22-Aug-2019	22-Aug-2019
	281	321	248	250	255	259	267					
	BH4	BH5	BH6	BH6	BH6	BH6	BH6					
	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL					
	6.50	0.30	0.60	0.90	2.80	4.00	7.80					
	6.95	1.00										
	22-Aug-2019	22-Aug-2019	22-Aug-2019	22-Aug-2019	22-Aug-2019	22-Aug-2019	22-Aug-2019					
	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM					
Determinand	Accred	SOP	Units	LOD								
ACM Type	U	2192		N/A								
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected							
ACM Detection Stage	U	2192		N/A								
Moisture	N	2030	%	0.020	7.3	20	22	27	15	17	8.8	
pH	U	2010		N/A	[B] 7.7	[B] 11.1	[B] 7.3	[B] 6.4	[B] 6.4	[B] 6.4	[B] 3.6	
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40	0.98	0.98	1.0	1.2				
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.35	0.76	0.68	0.46	0.21	0.12	2.5	
Arsenic	U	2450	mg/kg	1.0	17	41	18					
Cadmium	U	2450	mg/kg	0.10	0.22	0.63	0.47					
Chromium	U	2450	mg/kg	1.0	20	35	29					
Copper	U	2450	mg/kg	0.50	23	69	31					
Mercury	U	2450	mg/kg	0.10	< 0.10	0.18	0.12					
Nickel	U	2450	mg/kg	0.50	20	49	30					
Lead	U	2450	mg/kg	0.50	32	80	46					
Selenium	U	2450	mg/kg	0.20	< 0.20	0.67	0.45					
Zinc	U	2450	mg/kg	0.50	48	150	100					
Naphthalene	U	2700	mg/kg	0.10	[B] 2.0	[B] 0.97	[B] < 0.10					
Acenaphthylene	U	2700	mg/kg	0.10	[B] 1.1	[B] 0.43	[B] < 0.10					
Acenaphthene	U	2700	mg/kg	0.10	[B] 5.0	[B] 1.0	[B] < 0.10					
Fluorene	U	2700	mg/kg	0.10	[B] 3.0	[B] 1.2	[B] < 0.10					
Phenanthrene	U	2700	mg/kg	0.10	[B] 72	[B] 9.8	[B] 2.0					
Anthracene	U	2700	mg/kg	0.10	[B] 19	[B] 2.8	[B] 0.47					
Fluoranthene	U	2700	mg/kg	0.10	[B] 84	[B] 13	[B] 0.27					
Pyrene	U	2700	mg/kg	0.10	[B] 79	[B] 12	[B] 2.4					
Benzo[a]anthracene	U	2700	mg/kg	0.10	[B] 33	[B] 7.9	[B] 0.91					
Chrysene	U	2700	mg/kg	0.10	[B] 37	[B] 7.0	[B] 0.87					
Benzo[b]fluoranthene	U	2700	mg/kg	0.10	[B] 0.29	[B] 7.8	[B] 1.2					
Benzo[k]fluoranthene	U	2700	mg/kg	0.10	[B] 16	[B] 4.5	[B] 0.64					
Benzo[a]pyrene	U	2700	mg/kg	0.10	[B] 33	[B] 5.4	[B] 0.67					
Indeno(1,2,3-c,d)Pyrene	U	2700	mg/kg	0.10	[B] 22	[B] 3.5	[B] 0.51					
Dibenz(a,h)Anthracene	U	2700	mg/kg	0.10	[B] 6.1	[B] 0.59	[B] 0.13					
Benzo[g,h,i]perylene	U	2700	mg/kg	0.10	[B] 19	[B] 3.2	[B] 1.3					
Total Of 16 PAH's	U	2700	mg/kg	2.0	[B] 430	[B] 81	[B] 11					
Total Phenols	U	2920	mg/kg	0.30	0.54	1.3	1.2					

Report Information

Key

- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
- < "less than"
- > "greater than"
- \$ This information has been supplied by the client and can affect the integrity of test data.

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

CoDa Structures

Consulting Civil & Structural Engineers
14 Springfield Court
GUISELEY
Leeds LS20 8FD

**PHASE 2 ENGINEERING & ENVIRONMENTAL
ASSESSMENT
FOR A PROPOSED EXTENSION AND WASTER
TRANSFER STATION AT
BARR STREET, HUDDERSFIELD**

**APPENDIX H
GEOTECHNICAL TEST RESULTS**

Standard Penetration Test Results

Site : MYERS BUILDING SUPPLIES, BARR STREET, HUDDERSFIELD, WEST YORKSHIRE

Job Number

Client : CODA STRUCTURES

Sheet

Engineer:

1 / 1

Borehole Number	Base of Borehole (m)	End of Seating Drive (m)	End of Test Drive (m)	Test Type	Seating Blows per 75mm		Blows for each 75mm penetration				Result	Comments
					1	2	1	2	3	4		
BH1	1.20	1.35	1.65	SPT	1	1	1	1	1	1	N=4	*Blows/seating penetration
BH1	2.00	2.15	2.45	SPT	4	3	3	4	4	5	N=16	
BH1	3.00	3.15	3.45	SPT	6	7	8	8	9	8	N=33	
BH1	4.00	4.15	4.45	SPT	5	7	11	9	9	8	N=37	
BH1	5.50	5.65	5.95	SPT	6	6	8	7	11	10	N=36	
BH1	7.00	7.15	7.45	SPT	3	6	9	8	7	9	N=33	
BH1	8.50	8.65	8.73	SPT	15	14	50				50/80mm	
BH1	9.00	9.02	9.02	SPT	25		25				25*/20mm 25/0mm	
BH2	1.20	1.35	1.65	SPT	1	0	1	1	0	1	N=3	
BH2	2.00	2.15	2.45	SPT	2	1	2	3	3	4	N=12	
BH2	3.00	3.15	3.45	SPT	10	10	19	14	16	22	N=71	
BH2	4.00	4.15	4.45	SPT	7	9	12	9	6	9	N=36	
BH2	5.50	5.65	5.95	SPT	22	11	13	10	9	10	N=42	
BH2	7.00	7.15	7.45	SPT	3	3	3	4	6	7	N=20	
BH2	8.50	8.65	8.72	SPT	17	24	50				50/70mm	
BH2	9.00	9.01	9.01	SPT	25		25				25*/10mm 25/0mm	
BH4	1.20	1.35	1.65	SPT	1	1	1	1	1	1	N=4	
BH4	3.00	3.15	3.45	SPT	8	9	8	9	8	10	N=35	
BH4	4.00	4.15	4.45	SPT	2	4	4	5	5	5	N=19	
BH4	5.00	5.15	5.45	SPT	4	5	5	7	8	7	N=27	
BH4	6.50	6.65	6.77	SPT	6	14	45				45/115mm	
BH4	7.30	7.38	7.42	SPT	20		50				20*/75mm 50/40mm	
BH5	1.20	1.35	1.65	SPT	1	0	1	1	1	1	N=4	
BH5	2.00	2.15	2.45	SPT	1	2	1	2	1	1	N=5	
BH5	3.00	3.15	3.45	SPT	2	2	1	1	2	1	N=5	
BH5	4.00	4.15	4.45	SPT	6	7	9	13	11	10	N=43	
BH5	5.50	5.65	5.95	SPT	8	6	7	7	9	12	N=35	
BH5	7.00	7.15	7.45	SPT	9	6	11	9	12	10	N=42	
BH5	8.50	8.65	8.68	SPT	12	18	50				50/25mm	
BH5	9.00	9.01	9.02	CPT	25		25				25*/10mm 25/10mm	
BH6	1.00	1.15	1.45	SPT	3	2	1	1	1	1	N=4	*Blows/seating penetration
BH6	2.00	2.15	2.45	SPT	2	3	0	0	0	0	N=0	
BH6	3.00	3.15	3.45	SPT	2	8	5	7	4	4	N=20	
BH6	4.00	4.15	4.45	SPT	2	3	5	3	3	5	N=16	
BH6	5.00	5.15	5.45	SPT	2	3	2	3	3	4	N=12	
BH6	6.00	6.15	6.45	SPT	2	3	11	3	5	4	N=23	
BH6	7.00	7.15	7.45	SPT	2	1	3	5	4	4	N=16	
BH6	8.00	8.15	8.23	SPT	13	22	50				50/75mm	
BH6	8.90	8.98	9.05	SPT	33		50				33*/75mm 50/75mm	

CoDa Structures

Consulting Civil & Structural Engineers
14 Springfield Court
GUISELEY
Leeds LS20 8FD

**PHASE 2 ENGINEERING & ENVIRONMENTAL
ASSESSMENT
FOR A PROPOSED EXTENSION AND WASTER
TRANSFER STATION AT
BARR STREET, HUDDERSFIELD**

APPENDIX I

**CONTAMINATION ASSESSMENT CRITERIA
FOR COMMERCIAL USE**

	Units	Commercial Use	Derivation Tool
ORGANICS			
Sum of PCDDs, PCDFs, (eg PCBs)	mg/kg	8	EA 2009
Phenol	mg/kg	1100000	EA 2009
PAH-16 EPA			
Acenaphthene	mg/kg	85000	LQM/CIEH
Acenaphthylene	mg/kg	84000	LQM/CIEH
Anthracene	mg/kg	530000	LQM/CIEH
Benzo (a) Anthracene	mg/kg	90	LQM/CIEH
Benzo (a) pyrene	mg/kg	14	LQM/CIEH
Benzo (b) fluoranthene	mg/kg	100	LQM/CIEH
Benzo (k) fluoranthene	mg/kg	100	LQM/CIEH
Benzo (g, h, i) perylene	mg/kg	44	LQM/CIEH
Chrysene	mg/kg	140	LQM/CIEH
Di-benzo (a, h) anthracene	mg/kg	13	LQM/CIEH
Indeno (1, 2, 3-cd) pyrene	mg/kg	60	LQM/CIEH
Fluoranthene	mg/kg	23000	LQM/CIEH
Fluorene	mg/kg	64000	LQM/CIEH
Napthalene	mg/kg	200	LQM/CIEH
Phenanthrene	mg/kg	22000	LQM/CIEH
Pyrene	mg/kg	54000	LQM/CIEH
Total PAHs	mg/kg	no sum	
VOGS			
Trichloroethylene	mg/kg	6.9	RISC WORKBENCH 4
1,1,1 Trichloroethanes	mg/kg	552	LQM Ltd.
1,1,1,2,2, Tetrachloroethene	mg/kg	63.1	LQM Ltd.
Vinyl Chloride	mg/kg	0.0059	LQM Ltd.
1,2 Dichloroethane	mg/kg	53.6	LQM Ltd.
Tetrachloroethene	mg/kg	150	LQM Ltd.
Chlorobenzene	mg/kg	140000	LQM Ltd.
Hexachlorobutadiene	mg/kg	1.98	LQM Ltd.
Trichloroethene	mg/kg	6.4	LQM Ltd.
Trichloromethane	mg/kg	79.4	LQM Ltd.
GENERAL INORGANICS			
Easily Liberatable Cyanide (free)	mg/kg	36	Acute effects Infant 1 dose 3g soil
Thiocyanate	mg/kg	50	Former ICRC Threshold Trigger Value
HEAVY METAL/METALLOIDS			
Arsenic	mg/kg	840	EA 2009
Cadmium	mg/kg	230	EA 2009
Chromium (III)	mg/kg	30400	LQM/CIEH
Chromium (VI)	mg/kg	30400	LQM/CIEH
Lead	mg/kg	750	EA 2009
Mercury (Inorganic)	mg/kg	3640	EA 2009
Nickel	mg/kg	1800	EA 2009
Selenium	mg/kg	13000	EA 2009
Boron	mg/kg	192000	LQM/CIEH
Copper	mg/kg	71700	LQM/CIEH
Zinc	mg/kg	665000	LQM/CIEH
Beryllium	mg/kg	420	LQM/CIEH
Vanadium	mg/kg	3160	LQM/CIEH
MONOCAROMATICS			
Benzene	mg/kg	#	LQM/CIEH
Toluene	mg/kg	Detected	LQM/CIEH
Ethylbenzene	mg/kg	640	LQM/CIEH
Xylenes	mg/kg	230	LQM/CIEH
ALIPHATIC HYDROCARBONS			
TPH Aliphatic>EC5-6	mg/kg	1800	LQM/CIEH
TPH Aliphatic>EC6-8	mg/kg	665000	LQM/CIEH
TPH Aliphatic>EC8-10	mg/kg	192000	LQM/CIEH
TPH Aliphatic>EC10-12	mg/kg	no sum	LQM/CIEH
TPH Aliphatic>EC12-16	mg/kg	<5	LQM/CIEH
TPH Aliphatic>EC16-21	mg/kg	#	LQM/CIEH
TPH Aliphatic>EC21-34	mg/kg	1100000	LQM/CIEH
TPH Aromatic>EC6-7	mg/kg	640	LQM/CIEH
TPH Aromatic>EC7-8	mg/kg	230	LQM/CIEH
TPH Aromatic>EC8-10	mg/kg	30400	LQM/CIEH
TPH Aromatic>EC10-12	mg/kg	750	LQM/CIEH
TPH Aromatic>EC12-16	mg/kg	3640	LQM/CIEH
TPH Aromatic>EC16-21	mg/kg	13000	LQM/CIEH
TPH Aromatic>EC21-35	mg/kg	71700	LQM/CIEH
PESTICIDES			
Atrazine	mg/kg	152	LQM Ltd.
OTHERS			
pH	Value	<5	Former ICRC Threshold Trigger Value
Asbestos	-	Presence	Lab Screening
Sulphate	mg/l	500	Class DS1 - BRE Special Digest 1
Sulphide	mg/kg	250	Former ICRC Threshold Trigger Value
Sulphur	mg/kg	5000	Former ICRC Threshold Trigger Value
Calorific Value	MJ/kg	2	Fire Research

NOTES

- Derived Intervention Values are based on a SOM of 1.0%
For reference POC = 0.58* SOM. Check POC/SOM against your Conceptual Site Model.
- Individual analyte values are screened initially and if exceedences are noted the 95% UCL of the mean value of the analyte is calculated.
- These values are for initial screening for potential risk to human health only. They are not necessarily remediation thresholds.
- LQM Ltd. - Refers to LQM Ltd. Generic Assessment Criteria for Human Health Risk Assessment
- LQM/CIEH. - Refers to LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment (2nd Edition)