# FAIRHURST

## THURNSCOE, BARNSLEY

## FACTUAL REPORT ON GROUND INVESTIGATION

**Contract: 41976**

**Date: December 2016**

Ian Farmer Associates (1998) Limited
14-15 Rufford Court, Hardwick Grange,
Warrington, WA1 4RF
Tel: 01925 855 440
warrinton@ianfarmer.co.uk

# FACTUAL REPORT ON

# GROUND INVESTIGATION

carried out at

**THURNSCOE, BARNSLEY**

Prepared for

**FAIRHURST**
**51a St. Pauls Street,**
**Leeds**
**LS1 2TE**

Contract No: 41976

Date: December 2016

Ian Farmer Associates (1998) Limited
14-15 Rufford Court, Hardwick Grange, Woolston, Warrington, WA1 4RF
Tel: 01925 855 440
Fax: 01925 855 441

| Issue & Revision Record | | | |
|---|---|---|---|
| **Contract Number:** | | **41976** | |
| **Contract Name:** | | **Thurnscoe, Barnsley** | |
| **Client:** | | **Fairhurst** | |
| **Engineer:** | | **Fairhurst** | |
| **Report Title:** | | **Factual Report on Ground Investigation** | |
| **Version** | **Issue Date** | **Report / revision details** | **Distribution** |
| V1 | 15/12/2016 | Complete report on ground investigation. Gas monitoring on going. | PDF copy to Fairhurst |
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## CONTENTS


| | | |
|---|---|---|
| 1.0 | INTRODUCTION | 3 |
| 2.0 | THE SITE | 4 |
| | 2.1 Site Location | 4 |
| | 2.2 Site Description | 4 |
| 3.0 | SITE WORK | 5 |
| 4.0 | LABORATORY TESTS | 6 |
| | 4.1 Geotechnical Testing | 6 |
| | 4.2 Chemical Testing | 6 |
| 5.0 | REFERENCES | 8 |

| | | |
|---|---|---|
| APPENDIX 1 | - | DRAWINGS |
| Figure A1.1 | - | Site Location Plan |
| Figure A1.2 | - | Site Plan |
| APPENDIX 2 | - | SITE WORK |
| | | **General Notes on Site Work** |
| | | SPT Hammer Certificate |
| BH01 to BH06 | - | Borehole Records |
| TP01 to TP10 | - | Trial Pit Records |
| P01, P02 and P07 | - | Rotary Open Hole Records |
| APPENDIX 3 | - | GEOTECHNICAL LABORATORY TEST RESULTS |
| | | **General Notes on Laboratory Tests on Soils** |
| Reports 41976 & 41976c | - | Results of Laboratory Tests |
| APPENDIX 4 | - | CHEMICAL LABORATORY TEST RESULTS |
| Report 16-82190 | - | Results of Chemical Tests |
| Report 16-83137 | - | Results of Water Tests |
| APPENDIX 5 | - | MONITORING |
| | - | Results of Monitoring |
| APPENDIX 6 | - | PHOTOGRAPHS |
| | - | Trial Pit Photographs |

## 1.0 INTRODUCTION

1.1 On the instructions of Fairhurst, a ground investigation was undertaken to determine ground and groundwater conditions at the site.

1.2 This report has been prepared for the sole use of the Client for the purpose described and no extended duty of care to any third party is implied or offered. Third parties using any information contained within this report do so at their own risk.

1.3 Any comments given in this report and the opinions expressed herein are based on the information received, the conditions encountered during site works, and on the results of tests made in the field and laboratory. However, there may be conditions prevailing at the site which have not been disclosed by the investigation and which have not been taken into account in the report.

1.4 Groundwater observations may be made at the time the site work was carried out or during subsequent monitoring. It should be noted that groundwater levels may vary outside the limits of these observations due to seasonal or other effects.

## 2.0 THE SITE

### 2.1 Site Location

2.1.1 The site is situated off Barrowfield Road approximately 1km to the southeast of Thurnscoe town centre.

2.1.2 The site may be located by National Grid reference SE 463 052

2.1.3 A site location plan is included in Appendix 1, Figure A1.1.

### 2.2 Site Description

2.2.1 The site comprised of a level rectangular area of grassland.

2.2.2 The approximate site area was 2.956Ha.

2.2.3 Access to the site was south off Barrowfield Road. A bund was located across the site access.

2.2.4 The site comprised areas of waterlogging.

2.2.5 Two concrete circles located to the southeast of the site possibly represent historical mine shafts.

2.2.6 The site was bound to the north by Barrowfield Road, and to the south, east and west by Phoenix Park.

2.2.7 A site plan is included in Appendix 1, Figure A1.2.

## 3.0 SITE WORK

3.1 The site work was carried out between 17th and 25th October 2016.

3.2 The locations of exploratory holes were agreed on site with the Engineer.

3.3 The site works were carried out on the basis of the practices set out in and BS 5930:2015 (ref. 5.1), BS EN ISO 14688-1:2002+A1:2013 (ref. 5.2), BS EN ISO 14689-1:2003 (ref. 5.3) and BS 10175:2011+A1:2013 (ref. 5.4).

3.4 The following exploratory holes were undertaken:

- BH01 to BH06: Cable percussion boreholes
- TP01 to TP10: Machine excavated trial pits
- P01, P02 and P07: Rotary open hole boreholes

3.5 A site plan showing the position of the exploratory holes is presented in Appendix 1 as Figure A1.2.

3.6 The depths of the exploratory holes, descriptions of strata encountered and comments on groundwater conditions are presented on the records in Appendix 2

3.7 A photographic record of the trial pits (TP01 to TP10) are presented in Appendix 6.

3.8 A Cable Avoidance Tool (CAT) survey was undertaken at each exploratory hole location prior to excavation. At the location of boreholes an inspection pit was excavated by hand to a depth of 1.20m below ground level to check for buried services.

3.9 Representative disturbed and undisturbed samples were taken at the depths shown on the exploratory hole records. Samples for environmental purposes were collected in appropriate containers and kept in cool boxes for daily despatch to the analytical laboratory.

3.10 Standard penetration tests (SPT) (ref. 5.4) were carried out in boreholes in the various strata to assess the relative density or consistency. The values of penetration resistance are presented on the borehole records. Energy ratio calibration certification for SPT hammers used on site are presented in Appendix 2.

3.11 A perforated standpipe, surrounded by pea shingle was installed in boreholes BH01, BH04 and BH06. The details of the installation are presented on the borehole record in Appendix 2.

3.12 The standpipe was protected at surface by a lockable flush stopcock cover.

3.13 Gas and groundwater monitoring visits have been undertaken upon completion of site works.

## 4.0 LABORATORY TESTS

### 4.1 Geotechnical Testing

4.1.1 Schedules for geotechnical testing were prepared by Fairhurst.

4.1.2 Soil samples for testing were prepared in accordance with BS1377: Part One: 1990 (ref. 5.6) and representative sub-samples were taken for testing. The following tests were carried out:

- 12 No. Moisture contents
- 4 No. Atterberg Limits (Liquid and Plastic Limit)
- 1 No. Particle Density
- 1 No. Particle size distribution (sieve analysis)
- 2 No. Compaction using 4.5kg rammer
- 4 No. Remoulded California Bearing Ratio
- 1 No. Undrained single stage triaxial
- 1 No. Moisture Condition Value (MCV)

4.1.3 The results of the soil tests are presented in Appendix 3, Test Report 41976/1 and 41976C/1.

### 4.2 Chemical Testing

4.2.1 Schedules for chemical testing were prepared by Fairhurst.

4.2.2 Chemical analysis was carried out on fifteen samples of soil and one sample of water. The nature of the analysis is detailed below:

4.2.3 **General suite comprises:**

- arsenic, cadmium, chromium IV and hexavalent, lead, mercury, selenium, boron (water soluble), copper, nickel, zinc
- pH, total sulphate, water soluble sulphate, sulphur
- total phenols, total, complex and free cyanide, sulphide
- speciated PAH, total petroleum hydrocarbons (TPH)
- organic matter, asbestos screen and quantification
- caloric value

4.2.4 **General concrete suite comprises (soil):**

- total sulphate, water soluble sulphate, sulphide, total sulphur, water soluble magnesium, ammonium ion, pH, chloride ions, nitrate ions, all tested in accordance with BRE Special Digest No.1 2005.

4.2.5 **General Water suite comprises:**

- arsenic, cadmium, chromium IV and hexavalent, lead, mercury, selenium, boron (water soluble), copper, nickel, zinc
- pH, total sulphate, water soluble sulphate, sulphur
- total phenols, total, complex and free cyanide, sulphide
- speciated PAH, total petroleum hydrocarbons (TPH)
- total organic content

4.2.6 **General concrete suite comprises (water):**

- total sulphate, water soluble sulphate, sulphide, total sulphur, water soluble magnesium, ammonium ion, pH, chloride ions, nitrate ions, all tested in accordance with BRE Special Digest No.1 2005.

4.2.7 The results of chemical analysis on soil samples are presented in Appendix 4, Test Report 16-82190.

4.2.8 The results of chemical analysis on water samples are presented in Appendix 4, Test Report 16-83137.

## 5.0 REFERENCES

5.1 British Standards Institution: BS 5930:2015 'Code of practice for ground investigations.' BSI 2015.

5.2 British Standards Institution: BS EN ISO 14688-1:2002+A1:2013. 'Geotechnical investigation and testing – Identification and Classification of Soil – Part 1 Identification and description.' BSI 2013.

5.3 British Standards Institution: BS EN ISO 14689-1:2003. 'Geotechnical investigation and testing – Identification and Classification of Rock – Part 1 Identification and description.' BSI 2003. Incorporating Corrigendum No. 1 February 2007.

5.4 British Standards Institute: BS 10175 'The investigation of potentially contaminated sites. Code of practice', BSI:2011+A1:2013.

5.5 British Standards Institute: BS EN ISO 22476-3: 2005 + A1: 2011. 'Geotechnical investigation and testing. Field testing. Standard penetration test.'

5.6 British Standard 1377:1990, Part 1-9, 'Methods of Test for Soils for Civil Engineering Purposes'.

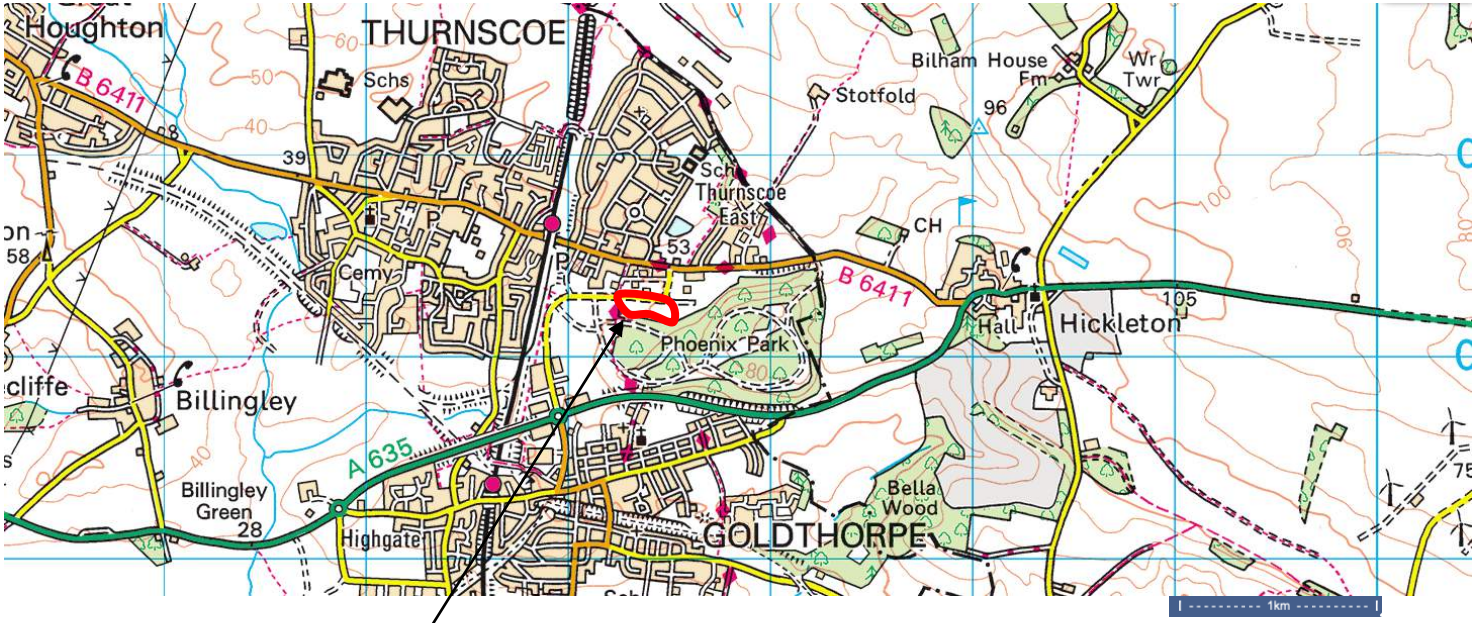
For and on behalf of Ian Farmer Associates (1998) Limited

H L Hadwin
BSc (Hons) MSc FGS
Engineering Geologist

J A Latimer
BSc (Hons) FGS
Director

**APPENDIX 1**

**DRAWINGS**

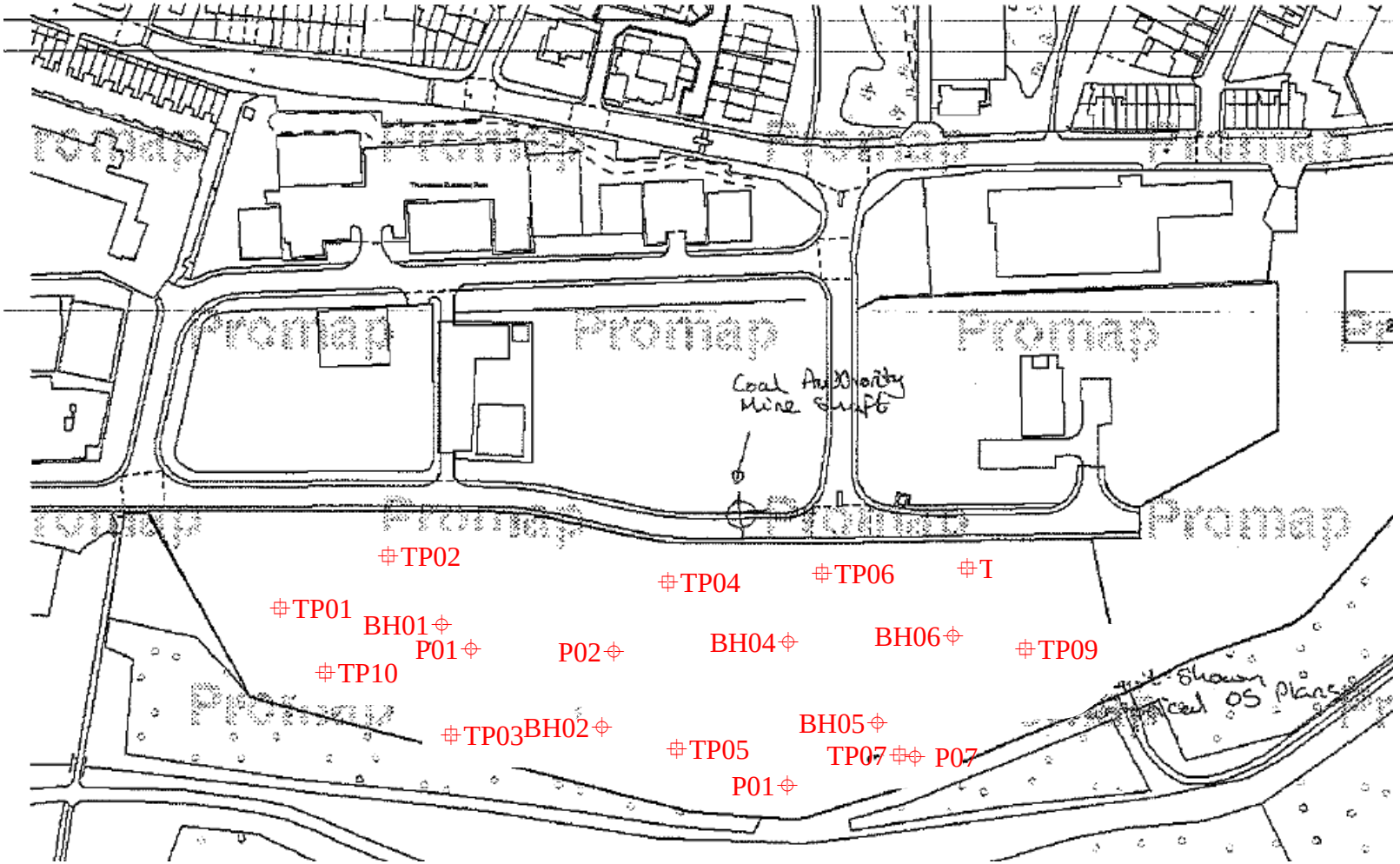



N

Site

| |
|---|
| **PROJECT: 41976 Thurnscoe, Barnsley** |
| **FIGURE No. A1.1** **SCALE: As Indicated** |
| **TITLE: Site Location Plan** |
| IAN FARMER ASSOCIATES Geotechnical & Environmental Specialists |

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|---|
| **PROJECT: 41976 Thrunscoe, Barnsley** |
| **FIGURE No. A1.2** **SCALE: NTS** |
| **TITLE: Exploratory Hole Location Plan** |
| IAN FARMER ASSOCIATES Geotechnical & Environmental Specialists |

**APPENDIX 2**

**SITE WORK**

## APPENDIX 2

## GENERAL NOTES ON SITE WORKS

### A2.1 SITE WORK

#### A2.1.1 Rotary Drilling

For exploration within rock rotary drilling methods are employed, where the drill bit is rotated on the bottom of the borehole. This method is occasionally used for drilling within soils. The drilling fluid is transferred from the surface though hollow drilling rods to the bit cooling and lubricating. Drilling fluids commonly comprise clean water, air, foam, mud or polymers which aid the transportation of drill cuttings to the surface and maximise core recovery.

There are two basic types of rotary drilling:

- Open hole where the drill bit cuts all the material within the diameter of the borehole. This technique is sometimes used in soils and weak rocks as a rapid and economical means of making holes for taking soil samples, carrying out insitu soil tests, installing instruments and probing for voids such as mine workings or solution cavities. The only samples recovered are the poor quality drill cuttings.

- Core drilling where an annular bit fixed to the bottom of the core barrel cuts a core, which is recovered within the innermost tube of the core barrel. Coring is normally carried out by triple tube core barrels. At the end of the core run the core barrel assembly is brought to the surface. The core is prevented from dropping out of the barrel by a core catcher made of spring steel. The non-rotating inner barrel contains a removable sample tube or liner. At the end of each coring run the liner is extracted from the barrel and stored in a core box, where it can be photographed, described and tested.

#### A2.1.2 Light Cable Percussion Boring

For routine soil exploration to depths in excess of 3m, the light cable percussion rig is generally employed for boring through soils and weak rocks. It consists of a powered winch and tripod frame, with running wheels that are permanently attached so that the rig may be towed behind a suitable vehicle. The rig is towed into position and set up using its own winching system.

The locations of services are checked to make sure the borehole is not situated unacceptably near any services. Regardless of the proximity of services, a CAT scan is undertaken at the borehole location and a trial hole dug to 1.20m by hand.

Boreholes are advanced in soil by the percussive action of the cable tool. The force of the cylindrical tool as it is dropped a short distance cuts a plug of cohesive soil that is removed by the tool.

In non-cohesive soils, the borehole is advanced by a ‘shell’, otherwise known as a ‘bailer’ or ‘sand pump’, which incorporates a clack valve. Material is transferred into the shell and retained by the clack valve. The water level in a borehole is maintained above that in the surrounding granular soil to allow for temporary reductions in the head of water as the shell is withdrawn from the borehole. Water should flow from the borehole into the surrounding soil at all times to prevent ‘piping’ and loosening the soil at the base of the hole. The casing is always advanced with the borehole in granular soil so that material is drawn from the base rather than the borehole sides.

Obstructions to boring are overcome by fitting a serrated chiselling ring to the base of the percussion tool. For large obstructions, a heavy chisel with a hardened cutting edge may have to be used.

Disturbed samples are taken in polythene bags, jars or tubs that are sealed against air or water loss.

Undisturbed samples are generally taken in cohesive materials at changes in strata and at one metre intervals to 5 metres then at 1.5 metre intervals to the full depths of the borehole. The general purpose open-tube sampler is suitable for firm to stiff clays, but is often used to retrieve disturbed samples of weak rocks, soft or hard clay and also clayey sand or silts. This has been adopted for routine use, and usually consists of a 100mm internal diameter tube (U100), which is capable of taking soil samples up to 450mm in length. The undisturbed samples are sealed at each end using micro-crystalline wax to prevent drying.

Standard penetration tests are generally carried out in non-cohesive soils but also in stiff clays and soft rocks at frequencies similar to that of undisturbed sampling.

#### A2.1.3 Trial Pits

Shallow trial pits are generally dug by mechanical excavator, however, in difficult access locations or adjacent to structures, such pits may be hand dug. Pits are best used where the ground will stand unsupported and generally, the maximum depth of machine dug pits is 4m to 5m. Where personnel are required to enter pits, it is essential that side support is provided. Entry by personnel into unsupported pits deeper than 1.2m is not allowed for health and safety reasons.

Trial pits allow the in-situ condition of the ground to be examined both laterally and vertically and also allow discontinuities to be recorded. The field record should give the orientation of the pit with details of which face was logged, assessment of stability of sides of pit and groundwater as well as the strata encountered. Photographs of the pit should also be taken.

In-situ testing, such as hand penetrometer, hand vane, Macintosh probe, or similar, can be undertaken in the sides or base of pits while both disturbed and undisturbed samples recovered.

It is generally advisable to backfill the pits as soon as possible, open pits should not be left unattended.

### A2.2 IN-SITU TESTS

#### A2.2.1 Standard Penetration Test

The Standard Penetration Test is carried out in accordance with the proposals recommended in ref 5.4.

The standard penetration test, **SPT**, covers the determination of the resistance of soils to the penetration of a split barrel sampler. A 50mm diameter split barrel sampler is driven 450mm into the soil using a 65kg hammer with a 760mm drop. The penetration resistance is expressed as the number of blows required to obtain 300mm penetration below an initial seating drive of 150mm through any disturbed ground at the bottom of the borehole. The number of blows to achieve the standard penetration of 300mm is reported as the ‘N’ value.

The test is generally carried out in fine soils, however, it may also be carried out in coarse granular soils, weak rocks and glacial tills using the same procedure as for the SPT but with a 50mm diameter, 60° apex solid cone replacing the split spoon sampler, **CPT.**

When attempting the standard penetration test in very dense material or weathered rocks it may be necessary to terminate the test before completion to prevent damage to the equipment. In these circumstances it is important to distinguish how the blow count relates to the penetration of the sampler. This may be achieved in the following manner:

- Where the seating drive has been completed, the test drive is terminated if 50 blows are reached before the full penetration of 300mm is achieved. The penetration for 50 blows is recorded and an approximate N value obtained by linear extrapolation of the number of blows for the partial test drive.

- If the seating drive of 150mm is not achieved within the first 25 blows, the penetration after 25 blows is recorded and the test drive then commenced.

- For tests in soft rocks, the test drive should be terminated after 100 blows where the penetration of 300mm has not been achieved.

The N-value obtained from the Standard Penetration Test may be used to assess the relative density of sands and gravels as follows:

| Term | SPT N-Value : Blows/300mm Penetration |
|---|---|
| Very Loose | 0 - 4 |
| Loose | 4 - 10 |
| Medium Dense | 10 - 30 |
| Dense | 30 - 50 |
| Very Dense | Over 50 |

## A2.3 SAMPLES

U(x) represents undisturbed 100mm diameter sample with (x) being the number of blows required to obtain sample.

U NR| indicates undisturbed sample not recovered

B represents large bulk disturbed samples

D represents small disturbed sample

ES represents environmental sample

W represents water sample

▽ respresents water strike

▼ represents level to which water rose

## A2.4 DESCRIPTION OF SOILS

### A2.4.1 General

The procedures and principles given in Section 6 of BS 5930:2015, (ref. 5.1) and BS EN ISO 14688-1:2002+A1:2013 (ref. 5.2) have been used in the soil descriptions contained within this report.

**Borehole Records**

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| Contract Name: | Client: | Borehole ID: |
|---|---|---|
| Thurnscoe | Fairhurst | BH01 |

| Contract Number: | Date Started: | Logged By: | Checked By: | Status: | Sheet 1 of 1 |
|---|---|---|---|---|---|
| 41976 | 17/10/2016 | BL | HH | DRAFT | |

| Cable Percussion Borehole Log | Easting: | Northing: | Ground Level: | Plant Used: | Print Date: 15/12/2016 | Scale: 1:50 |
|---|---|---|---|---|---|---|

Weather: | Termination: | SPT Hammer: N/R, Energy Ratio: N/R

| Samples & In Situ Testing | | | Strata Details | | | | Groundwater | |
|---|---|---|---|---|---|---|---|---|
| Depth | Sample ID | Test Result | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | Water Strike | Backfill/ Installation |
| 0.20 | ES1 | | | | | MADE GROUND: Dense, black, sandy, angular, fine to coarse GRAVEL including ash, brick and concrete | | |
| 0.40 | ES2 | | | | | | | |
| 0.50 - 1.00 | B3 | | | | | | | |
| 0.80 | ES4 | | | | | | | |
| 1.20 | | SPT(S) N=30 (5,7/9,9,6,6) | | | | | | |
| 1.20 - 1.65 | B5 | | | | | | | |
| 1.20 - 1.65 | D6 | | | | | | | |
| 2.00 | | SPT(S) N=30 (6,8/7,7,8,8) | | | | | | |
| 2.00 | ES7 | | | | | | | |
| 2.00 - 2.45 | B8 | | | | | | | |
| 2.00 - 2.45 | D9 | | | (4.90) | | | | |
| 3.00 | | SPT(S) N=30 (5,5/5,7,9,9) | | | | | | |
| 3.00 | ES10 | | | | | | | |
| 3.00 - 3.45 | B11 | | | | | | | |
| 3.00 - 3.45 | D12 | | | | | | | |
| 4.00 | | SPT(S) N=25 (4,5/5,7,7,6) | | | | *At 4.00m: medium dense.* | | |
| 4.00 | ES13 | | | | | | | |
| 4.00 - 4.45 | B14 | | | | | | | |
| 4.00 - 4.45 | D15 | | | | | | | |
| 5.00 - 5.45 | U16 | 23 blows. 60% recovery | | 4.90 | | Soft, light brownish grey to brown CLAY *At 5.00m: medium strength* | | |
| 5.50 | D17 | | | (0.80) | | | | |
| 5.70 | B18 | | | 5.70 | | Light brown and grey MUDSTONE. | | |
| 6.00 | | SPT(S) 50 (9,13/50 for 225mm) | | (0.90) | | | | |
| 6.00 | B19 | | | | | | | |
| 6.00 | D20 | | | | | | | |
| 6.30 | | SPT(S) 50 (10,15/50 for 150mm) | | 6.60 | | End of Borehole at 6.60m | | |
| 6.30 | D21 | | | | | | | |

| Start & End of Shift Observations | | | | | Borehole Diameter | | Casing Diameter | |
|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth (m) | Casing (m) | Water (m) | Depth (m) | Dia (mm) | Depth (m) | Dia (mm) |
| 24-10-2016 | 16:30 | 20.00 | | | 6.30 | 150 | 6.00 | 150 |

| Chiselling | | | |
|---|---|---|---|
| From (m) | To (m) | Duration | Remarks |
| 6.00 | 6.30 | 00:30 | |

| Installation | | | |
|---|---|---|---|
| Top (m) | Base (m) | Type | Dia (mm) |
| 0.00 | 0.50 | PLAIN | |
| 0.50 | 5.00 | SLOTTED | |

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

Water Strikes

| Strike (m) | Casing (m) | Sealed (m) | Time (mins) | Rose to (m) | Remarks |
|---|---|---|---|---|---|
| | | | | | |

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| Contract Name: | | Client: | | | Borehole ID: |
|---|---|---|---|---|---|
| Thurnscoe | | Fairhurst | | | BH02 |
| Contract Number: | Date Started: | Logged By: | Checked By: | Status: | Sheet 1 of 1 |
| 41976 | 18/10/2016 | BL | HH | DRAFT | |
| Cable Percussion Borehole Log | Easting: | Northing: | Ground Level: | Plant Used: | Print Date: 15/12/2016 |
| | | | | | Scale: 1:50 |

Weather: | Termination: | SPT Hammer: N/R, Energy Ratio: N/R

| Samples & In Situ Testing | | | Strata Details | | | | Groundwater | |
|---|---|---|---|---|---|---|---|---|
| Depth | Sample ID | Test Result | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | Water Strike | Backfill/ Installation |
| 0.20 | ES1 | | | (0.50) | | MADE GROUND: Black, sandy, clayey, angular to subangular, fine to coarse GRAVEL including brick and concrete (topsoil). | | |
| 0.50 | ES2 | | | 0.50 | | | | |
| 0.50 - 1.00 | B3 | | | | | MADE GROUND: Soft, dark brown, very gravelly CLAY with low cobble content. Gravel is angular to subangular, fine to coarse including brick, concrete and ash. | | |
| 0.90 | ES4 | | | | | | | |
| 1.20 | | SPT(C) 50 (26,30/50 for 225mm) | | | | | | |
| 1.20 - 1.65 | B5 | | | (2.10) | | | | |
| 2.00 | | SPT(C) N=38 (14,10/10,12,8,8) | | | | | | |
| 2.00 | ES6 | | | | | | | |
| 2.00 - 2.45 | B7 | | | | | | | |
| | | | | 2.60 | | MADE GROUND: Black, clayey, angular to subangular, fine and medium GRAVEL including ash, brick and mudstone | | |
| 3.00 | | SPT(S) 49 (18 for 75mm/49 for 150mm) | | | | | | |
| 3.00 | ES8 | | | | | | | |
| 3.00 - 3.45 | B9 | | | | | | | |
| 3.00 - 3.45 | D10 | | | | | | | |
| 4.00 | | SPT(S) 50 (25 for 75mm/50 for 75mm) | | (2.90) | | | | |
| 4.00 | ES11 | | | | | | | |
| 4.00 - 4.45 | B12 | | | | | | | |
| 4.00 - 4.45 | D13 | | | | | | | |
| 5.00 | | SPT(C) 50 (16,14/50 for 150mm) | | | | | | |
| 5.00 - 5.45 | B14 | | | | | | | |
| | | | | 5.50 | | Orangish brown MUDSTONE, recovered as stiff, friable clay. | | |
| 5.70 | | SPT(S) 50 (20,18/50 for 225mm) | | | | | | |
| 5.70 | D15 | | | (0.88) | | | | |
| | | | | 6.38 | | End of Borehole at 6.38m | | |

| Start & End of Shift Observations | | | | | Borehole Diameter | | Casing Diameter | |
|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth (m) | Casing (m) | Water (m) | Depth (m) | Dia (mm) | Depth (m) | Dia (mm) |
| 25-10-2016 | 16:30 | 20.00 | | | 6.08 | 150 | 5.70 | 150 |

| Chiselling | | | | Installation | | | |
|---|---|---|---|---|---|---|---|
| From (m) | To (m) | Duration | Remarks | Top (m) | Base (m) | Type | Dia (mm) |
| 1.20 | 1.30 | 01:00 | | 0.00 | 10.00 | PLAIN | |
| 3.00 | 4.00 | 00:30 | | 10.00 | 20.00 | SLOTTED | |
| 5.50 | 5.70 | 01:00 | | | | | |

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

Water Strikes

| Strike (m) | Casing (m) | Sealed (m) | Time (mins) | Rose to (m) | Remarks |
|---|---|---|---|---|---|
| | | | | | |

IAN FARMER ASSOCIATES

| Contract Name: | | Client: | | | Borehole ID: |
|---|---|---|---|---|---|
| Thurnscoe | | Fairhurst | | | BH03 |
| Contract Number: | Date Started: | Logged By: | Checked By: | Status: | Sheet 1 of 1 |
| 41976 | 18/10/2016 | BL | HH | DRAFT | |
| Cable Percussion Borehole Log | Easting: | Northing: | Ground Level: | Plant Used: | Print Date: 15/12/2016 |
| | | | | | Scale: 1:50 |

Weather: | Termination: | SPT Hammer: N/R, Energy Ratio: N/R

| Samples & In Situ Testing | | | Strata Details | | | | Groundwater | |
|---|---|---|---|---|---|---|---|---|
| Depth | Sample ID | Test Result | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | Water Strike | Backfill/ Installation |
| 0.30 | ES1 | | | (1.00) | | MADE GROUND: Grass over, brown, gravelly, fine and medium SAND. Gravel is angular, fine to coarse including brick and glass. | | |
| 0.50 - 1.00 | B2 | | | | | | | |
| 0.60 | ES3 | | | | | | | |
| 1.00 | ES4 | | | 1.00 | | MADE GROUND: Black, clayey, angular to subangular, fine to coarse GRAVEL with low cobble content. Gravel includes coal and mudstone. | | |
| 1.20 | | SPT(C) N=29 (4,6/6,8,7,8) | | | | | | |
| 1.20 - 1.65 | B5 | | | | | | | |
| 2.00 | | SPT(C) N=34 (3,6/10,8,7,9) | | | | | | |
| 2.00 | ES6 | | | | | | | |
| 2.00 - 2.45 | B7 | | | | | | | |
| 3.00 | | SPT(S) N=30 (3,6/9,7,8,6) | | | | *Below 3.00m: dense.* | | |
| 3.00 - 3.45 | B8 | | | (4.45) | | | | |
| 3.00 - 3.45 | D9 | | | | | | | |
| 4.00 | | SPT(S) N=33 (6,4/7,7,9,10) | | | | | | |
| 4.00 - 4.45 | B10 | | | | | | | |
| 4.00 - 4.45 | D11 | | | | | | | |
| 5.00 | | SPT(C) N=48 (7,10/13,18,14,3) | | | | | | |
| 5.00 | B13 | | | | | | | |
| 5.00 | ES12 | | | 5.45 | | End of Borehole at 5.45m | | |

Start & End of Shift Observations

| Date | Time | Depth (m) | Casing (m) | Water (m) |
|---|---|---|---|---|
| | | | | |

Borehole Diameter

| Depth (m) | Dia (mm) |
|---|---|
| 5.45 | 150 |

Casing Diameter

| Depth (m) | Dia (mm) |
|---|---|
| 5.00 | 150 |

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

Chiselling

| From (m) | To (m) | Duration | Remarks |
|---|---|---|---|
| 1.30 | 1.40 | 00:30 | |
| 4.50 | 4.70 | 00:30 | |
| 5.00 | 5.10 | 01:00 | |

Installation

| Top (m) | Base (m) | Type | Dia (mm) |
|---|---|---|---|
| | | | |

Water Strikes

| Strike (m) | Casing (m) | Sealed (m) | Time (mins) | Rose to (m) | Remarks |
|---|---|---|---|---|---|
| | | | | | |

IAN FARMER ASSOCIATES

| Contract Name: | | Client: | | | Borehole ID: |
|---|---|---|---|---|---|
| Thurnscoe | | Fairhurst | | | BH04 |
| Contract Number: | Date Started: | Logged By: | Checked By: | Status: | Sheet 1 of 1 |
| 41976 | 18/10/2016 | BL | HH | DRAFT | |
| Cable Percussion Borehole Log | Easting: | Northing: | Ground Level: | Plant Used: | Print Date: 15/12/2016 |
| | | | | | Scale: 1:50 |

Weather: | Termination: | SPT Hammer: N/R, Energy Ratio: N/R

| Samples & In Situ Testing | | | Strata Details | | | | Groundwater | |
|---|---|---|---|---|---|---|---|---|
| Depth | Sample ID | Test Result | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | Water Strike | Backfill/ Installation |
| 0.20 | ES1 | | | | | MADE GROUND: Soft, brown, gravelly CLAY with low cobble content. Gravel is angular to subangular, fine to coarse including brick and concrete. | | |
| 0.50 | ES2 | | | | | | | |
| 0.50 - 1.00 | B3 | | | (1.20) | | | | |
| 0.80 | ES4 | | | | | | | |
| 1.20 | | SPT(C) N=20 (4,4/3,5,6,6) | | 1.20 | | MADE GROUND: Medium dense, black, clayey, angular to subangular, fine to coarse GRAVEL with low cobble content and including ash, coal, and brick. | | |
| 1.20 - 1.65 | B5 | | | | | | | |
| 2.00 | | SPT(C) N=21 (2,4/5,5,4,7) | | | | | | |
| 2.00 | ES6 | | | | | | | |
| 2.00 - 2.45 | B7 | | | | | | | |
| 3.00 | | SPT(C) N=30 (3,5/7,7,8,8) | | (3.70) | | *At 3.00m: dense.* | | |
| 3.00 | ES8 | | | | | | | |
| 3.00 - 3.45 | B9 | | | | | | | |
| 4.00 | | SPT(C) N=25 (6,6/4,7,7,7) | | | | | | |
| 4.00 | ES10 | | | | | | | |
| 4.00 - 4.45 | B11 | | | | | | | |
| 5.00 | | SPT(S) 50 (8,14/50 for 225mm) | | 4.90 | | Dark brown grey banded MUDSTONE recovered as gravelly clay. | | |
| 5.00 - 5.45 | D12 | | | (1.05) | | | | |
| 5.80 | | SPT(S) 50 (25 for 75mm/50 for 75mm) | | 5.95 | | End of Borehole at 5.95m | | |
| 5.80 | D13 | | | | | | | |

1 2 3 4 5 6 7 8 9 10

Start & End of Shift Observations

| Date | Time | Depth (m) | Casing (m) | Water (m) |
|---|---|---|---|---|
| | | | | |

Borehole Diameter

| Depth (m) | Dia (mm) |
|---|---|
| 5.95 | 150 |

Casing Diameter

| Depth (m) | Dia (mm) |
|---|---|
| 5.80 | 150 |

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

Chiselling

| From (m) | To (m) | Duration | Remarks |
|---|---|---|---|
| 5.00 | 5.80 | 01:00 | |

Installation

| Top (m) | Base (m) | Type | Dia (mm) |
|---|---|---|---|
| 0.00 | 0.50 | PLAIN | |
| 0.50 | 5.00 | SLOTTED | |

Water Strikes

| Strike (m) | Casing (m) | Sealed (m) | Time (mins) | Rose to (m) | Remarks |
|---|---|---|---|---|---|
| | | | | | |

IAN FARMER ASSOCIATES

| Contract Name: | | Client: | | | Borehole ID: |
|---|---|---|---|---|---|
| Thurnscoe | | Fairhurst | | | BH05 |
| Contract Number: | Date Started: | Logged By: | Checked By: | Status: | Sheet 1 of 1 |
| 41976 | 18/10/2016 | BL | HH | DRAFT | |
| Cable Percussion Borehole Log | Easting: | Northing: | Ground Level: | Plant Used: | Print Date: 15/12/2016 |
| | | | | | Scale: 1:50 |

Weather: | Termination: | SPT Hammer: N/R, Energy Ratio: N/R

| Samples & In Situ Testing | | | Strata Details | | | | Groundwater | |
|---|---|---|---|---|---|---|---|---|
| Depth | Sample ID | Test Result | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | Water Strike | Backfill/ Installation |
| 0.40 | D2 | | | (4.73) | | MADE GROUND: Grass over, medium dense, black, clayey, sandy, angular to subangular, fine and medium GRAVEL including mudstone and brick. | | |
| 0.40 | ES1 | | | | | *Between 0.50m and 1.00m: layer of multicoloured, clayey gravel including mudstone and brick.* | | |
| 0.50 - 1.00 | B7 | | | | | | | |
| 0.60 | D3 | | | | | | | |
| 0.60 | ES4 | | | | | | | |
| 0.80 | D6 | | | | | | | |
| 0.80 | ES5 | | | | | | | |
| 1.20 | | SPT(C) N=15 (2,2/4,2,4,5) | | | | | | |
| 1.20 - 1.65 | B8 | | | | | | | |
| 2.00 | | SPT(C) N=26 (3,3/5,7,7,7) | | | | | | |
| 2.00 | ES10 | | | | | | | |
| 2.00 - 2.45 | B9 | | | | | | | |
| 3.00 | | SPT(C) N=19 (2,4/3,5,5,6) | | | | | | |
| 3.00 | ES11 | | | | | | | |
| 3.00 - 3.45 | B12 | | | | | | | |
| 4.00 | | SPT(C) N=41 (2,4/9,10,10,12) | | | | *Below 4.00m: dense* | | |
| 4.00 - 4.45 | B13 | | | | | | | |
| 4.50 | | SPT(C) 70 (20 for 75mm/70 for 150mm) | | | | | | |
| 4.50 - 4.73 | B14 | | | 4.73 | | End of Borehole at 4.73m | | |

| Start & End of Shift Observations | | | | | Borehole Diameter | | Casing Diameter | |
|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth (m) | Casing (m) | Water (m) | Depth (m) | Dia (mm) | Depth (m) | Dia (mm) |
| | | | | | 4.73 | 150 | 4.50 | 150 |

Remarks:
Service inspection pit hand excavated from GL to 1.20m.
Obstruction at 4.73m

| Chiselling | | | |
|---|---|---|---|
| From (m) | To (m) | Duration | Remarks |
| 3.30 | 3.70 | 00:30 | |
| 4.40 | 4.50 | 01:00 | |

| Installation | | | |
|---|---|---|---|
| Top (m) | Base (m) | Type | Dia (mm) |
| | | | |

Water Strikes

| Strike (m) | Casing (m) | Sealed (m) | Time (mins) | Rose to (m) | Remarks |
|---|---|---|---|---|---|
| | | | | | |

IAN FARMER ASSOCIATES

| Contract Name: | Client: | Borehole ID: |
|---|---|---|
| Thurnscoe | Fairhurst | BH06 |

| Contract Number: | Date Started: | Logged By: | Checked By: | Status: | Sheet 1 of 1 |
|---|---|---|---|---|---|
| 41976 | 20/10/2016 | BL | HH | DRAFT | |

| Cable Percussion Borehole Log | Easting: | Northing: | Ground Level: | Plant Used: | Print Date: | Scale: |
|---|---|---|---|---|---|---|
| | | | | | 15/12/2016 | 1:50 |

Weather: | Termination: | SPT Hammer: N/R, Energy Ratio: N/R

| Samples & In Situ Testing | | | Strata Details | | | | Groundwater | |
|---|---|---|---|---|---|---|---|---|
| Depth | Sample ID | Test Result | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | Water Strike | Backfill/ Installation |
| 0.20 | ES1 | | | | | MADE GROUND: Grass over, medium dense, light brown, dark brown, clayey, angular to subangular, fine to coarse GRAVEL including brick and ash. | | |
| 0.30 | ES2 | | | (0.70) | | | | |
| 0.50 - 1.00 | B3 | | | | | | | |
| 0.70 | ES4 | | | 0.70 | | MADE GROUND: Medium dense, black, clayey, angular to subangular, fine and medium GRAVEL including ash, mudstone, coal and occasional brick. | | |
| 1.20 | | SPT(C) N=15 (3,3/5,4,3,3) | | | | | | |
| 1.20 - 1.65 | B5 | | | | | | | |
| 2.00 | | SPT(C) N=19 (4,4/4,3,5,7) | | | | | | |
| 2.00 | ES6 | | | | | | | |
| 2.00 - 2.45 | B7 | | | | | | | |
| 3.00 | | SPT(C) N=21 (2,5/5,4,6,6) | | | | | | |
| 3.00 | ES8 | | | | | | | |
| 3.00 - 3.45 | B9 | | | (5.25) | | | | |
| 4.00 | | SPT(C) N=29 (4,6/6,6,7,10) | | | | *Below 4.00m: low cobble content of brick.* | | |
| 4.00 - 4.45 | B10 | | | | | | | |
| 5.00 | | SPT(C) N=32 (8,6/6,8,9,9) | | | | | | |
| 5.00 | B11 | | | | | | | |
| 5.50 | | SPT(C) N=55 (4,5/5,10,25,15) | | | | *At 5.50m: very dense* | | |
| 5.50 | B12 | | | | | | | |
| | | | | 5.95 | | End of Borehole at 5.95m | | |

1 2 3 4 5 6 7 8 9 10

| Start & End of Shift Observations | | | | | Borehole Diameter | | Casing Diameter | |
|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth (m) | Casing (m) | Water (m) | Depth (m) | Dia (mm) | Depth (m) | Dia (mm) |
| | | | | | 5.95 | 150 | 5.50 | 150 |

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

| Chiselling | | | | Installation | | | |
|---|---|---|---|---|---|---|---|
| From (m) | To (m) | Duration | Remarks | Top (m) | Base (m) | Type | Dia (mm) |
| 4.50 | 4.80 | 00:30 | | 0.00 | 0.50 | PLAIN | |
| 5.00 | 5.50 | 01:00 | | 0.50 | 5.00 | SLOTTED | |

Water Strikes

| Strike (m) | Casing (m) | Sealed (m) | Time (mins) | Rose to (m) | Remarks |
|---|---|---|---|---|---|
| | | | | | |

IAN FARMER ASSOCIATES

| Contract Name: | | Client: | | | Borehole ID: |
|---|---|---|---|---|---|
| Thurnscoe | | Fairhurst | | | P01 |
| Contract Number: | Date Started: | Loggged By: | Checked By: | Status: | Sheet 1 of 2 |
| 41976 | 24/10/2016 | N/A | HH | DRAFT | |
| Rotary Core Drilling Log | Easting: | Northing: | Ground Level: | Plant Used: Comacchio 205 | Print Date: 15/12/2016 | Scale: 1:50 |
| Weather: | | Termination: | | | |

| Coring Details | | | | | Strata Details | | | | Groundwater | |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth | TCR | SCR | RQD | Fracture Spacing | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | Water Strike | Backfill/ Installation |
| | | | | | | 0.20 | | Grass over TOSPOIL (drillers description). | | |
| | | | | | | (1.00) | | MADE GROUND: brick fill (drillers description). | | |
| | | | | | | 1.20 | | MADE GROUND: Mudstone fill (drillers description). | | |
| | | | | | | (3.90) | | | | |
| | | | | | | 5.10 | | Soft, brown CLAY (drillers description). | | |
| | | | | | | (1.90) | | | | |
| | | | | | | 7.00 | | Weak, brown MUDSTONE (drillers description). | | |
| | | | | | | (1.40) | | | | |
| | | | | | | 8.40 | | Weak, grey MUDSTONE (drillers description). | | |
| | | | | | | (2.10) | | | | |
| | | | | | | | | Continued next sheet | | |

1 2 3 4 5 6 7 8 9 10

| Start & End of Shift Observations | | | | |
|---|---|---|---|---|
| Date | Time | Depth (m) | Casing (m) | Water (m) |
| | | | | |

| Borehole Diameter | |
|---|---|
| Depth (m) | Dia (mm) |
| 7.00 | 121 |
| 20.00 | 92 |

| Casing Diameter | |
|---|---|
| Depth (m) | Dia (mm) |
| 7.00 | 121 |

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

Water Strikes

| Strike (m) | Casing (m) | Sealed (m) | Time (mins) | Rose to (m) | Remarks |
|---|---|---|---|---|---|
| | | | | | |

| Flush Information | | | | |
|---|---|---|---|---|
| Top (m) | Base (m) | Flush Type | Return | Flush Colour |
| 10.70 | 1.20 | Water | 100% | |
| 16.60 | 10.70 | Water | 80% | |
| 20.00 | 16.60 | Water | 100% | |

| Installation | | | |
|---|---|---|---|
| Top (m) | Base (m) | Type | Dia (mm) |
| | | | |

Fracture spacing as FI or Min, Average and Max in mm. TCR, SCR and RQD reported in %

| IAN FARMER ASSOCIATES | Contract Name: Thurnscoe | | Client: Fairhurst | | | Borehole ID: P01 |
|---|---|---|---|---|---|---|
| | Contract Number: 41976 | Date Started: 24/10/2016 | Loggged By: N/A | Checked By: HH | Status: DRAFT | Sheet 2 of 2 |
| Rotary Core Drilling Log | Easting: | Northing: | Ground Level: | Plant Used: Comacchio 205 | Print Date: 15/12/2016 | Scale: 1:50 |
| Weather: | | Termination: | | | | |

| Coring Details | | | | | Strata Details | | | | Groundwater | |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth | TCR | SCR | RQD | Fracture Spacing | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | Water Strike | Backfill/ Installation |
| | | | | | | 10.50 | | Weak COAL (drillers description). | | |
| | | | | | | 10.70 | | Weak, grey MUDSTONE (drillers description). | | |
| | | | | | | (5.90) | | | | |
| | | | | | | 16.60 | | Weak, grey SANDSTONE (drillers description). | | |
| | | | | | | (3.40) | | | | |
| | | | | | | 20.00 | | End of Borehole at 20.000m | | |

11 12 13 14 15 16 17 18 19 20

| Start & End of Shift Observations | | | | | Borehole Diameter | | Casing Diameter | |
|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth (m) | Casing (m) | Water (m) | Depth (m) | Dia (mm) | Depth (m) | Dia (mm) |
| | | | | | 7.00 | 121 | 7.00 | 121 |
| | | | | | 20.00 | 92 | | |

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

| Flush Information | | | | | Installation | | | |
|---|---|---|---|---|---|---|---|---|
| Top (m) | Base (m) | Flush Type | Return | Flush Colour | Top (m) | Base (m) | Type | Dia (mm) |
| 10.70 | 1.20 | Water | 100% | | | | | |
| 16.60 | 10.70 | Water | 80% | | | | | |
| 20.00 | 16.60 | Water | 100% | | | | | |

| Water Strikes | | | | | |
|---|---|---|---|---|---|
| Strike (m) | Casing (m) | Sealed (m) | Time (mins) | Rose to (m) | Remarks |
| | | | | | |

Fracture spacing as FI or Min, Average and Max in mm. TCR, SCR and RQD reported in %

IFA RC Issue Number: 2 Issue Date: 13/07/16

IAN FARMER ASSOCIATES

| Contract Name: | | Client: | | | Borehole ID: |
|---|---|---|---|---|---|
| Thurnscoe | | Fairhurst | | | P02 |
| Contract Number: | Date Started: | Loggged By: | Checked By: | Status: | Sheet 1 of 2 |
| 41976 | 25/10/2016 | | HH | DRAFT | |
| Rotary Core Drilling Log | Easting: | Northing: | Ground Level: | Plant Used: | Print Date: 15/12/2016 |
| | | | | | Scale: 1:50 |
| | Termination: | | | | |

| Coring Details | | | | | Strata Details | | | | Groundwater | |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth | TCR | SCR | RQD | Fracture Spacing | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | Water Strike | Backfill/ Installation |
| | | | | | | 0.10 | | Grass over TOPSOIL (drillers description). | | |
| | | | | | | (1.10) | | MADE GROUND: Brick fill (drillers description). | | |
| | | | | | | 1.20 | | MADE GROUND: Mudstone fill (drillers description). | | |
| | | | | | | (2.00) | | | | |
| | | | | | | 3.20 | | MADE GROUND: Brick fill (drillers description). | | |
| | | | | | | (2.60) | | | | |
| | | | | | | 5.80 | | Firm, brown CLAY (drillers description). | | |
| | | | | | | (1.20) | | | | |
| | | | | | | 7.00 | | Weak, grey/brown MUDSTONE (drillers description). | | |
| | | | | | | (1.80) | | | | |
| | | | | | | 8.80 | | Weak, grey MUDSTONE (drillers description). | | |
| | | | | | | (1.50) | | | | |
| | | | | | | | | Continued next sheet | | |

1 2 3 4 5 6 7 8 9 10

| Start & End of Shift Observations | | | | | Borehole Diameter | | Casing Diameter | |
|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth (m) | Casing (m) | Water (m) | Depth (m) | Dia (mm) | Depth (m) | Dia (mm) |
| | | | | | 7.00 | 121 | 7.00 | 121 |
| | | | | | 20.00 | 92 | | |

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

| Water Strikes | | | | | |
|---|---|---|---|---|---|
| Strike (m) | Casing (m) | Sealed (m) | Time (mins) | Rose to (m) | Remarks |
| | | | | | |

| Flush Information | | | | | Installation | | | |
|---|---|---|---|---|---|---|---|---|
| Top (m) | Base (m) | Flush Type | Return | Flush Colour | Top (m) | Base (m) | Type | Dia (mm) |
| 12.10 | 1.20 | Water | 100% | | 0.00 | 10.00 | PLAIN | |
| 12.20 | 12.10 | Water | 75% | | 10.00 | 20.00 | SLOTTED | |
| 15.80 | 12.20 | Water | 75% | | | | | |

Fracture spacing as FI or Min, Average and Max in mm. TCR, SCR and RQD reported in %

IAN FARMER ASSOCIATES

| Contract Name: | | Client: | | | Borehole ID: |
|---|---|---|---|---|---|
| Thurnscoe | | Fairhurst | | | P02 |
| Contract Number: | Date Started: | Loggged By: | Checked By: | Status: | Sheet 2 of 2 |
| 41976 | 25/10/2016 | | HH | DRAFT | |
| Rotary Core Drilling Log | Easting: | Northing: | Ground Level: | Plant Used: | Print Date: 15/12/2016 |
| | | | | | Scale: 1:50 |
| | Termination: | | | | |

| Coring Details | | | | | Strata Details | | | | Groundwater | |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth | TCR | SCR | RQD | Fracture Spacing | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | Water Strike | Backfill/ Installation |
| | | | | | | 10.30 | | |
| | | | | | | (0.30) | | Weak COAL (drillers description). |
| | | | | | | 10.60 | | Weak, dark grey MUDSTONE (drillers description). |
| | | | | | | (1.50) | | |
| | | | | | | 12.10 | | |
| | | | | | | 12.20 | | Weak COAL (drillers description). |
| | | | | | | | | Weak, grey MUDSTONE (drillers description). |
| | | | | | | (3.60) | | |
| | | | | | | 15.80 | | Weak, grey SANDSTONE (drillers description). |
| | | | | | | (4.20) | | |
| | | | | | | 20.00 | | End of Borehole at 20.000m |

| Start & End of Shift Observations | | | | |
|---|---|---|---|---|
| Date | Time | Depth (m) | Casing (m) | Water (m) |
| | | | | |

| Borehole Diameter | |
|---|---|
| Depth (m) | Dia (mm) |
| 7.00 | 121 |
| 20.00 | 92 |

| Casing Diameter | |
|---|---|
| Depth (m) | Dia (mm) |
| 7.00 | 121 |

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

Water Strikes

| Strike (m) | Casing (m) | Sealed (m) | Time (mins) | Rose to (m) | Remarks |
|---|---|---|---|---|---|
| | | | | | |

Flush Information

| Top (m) | Base (m) | Flush Type | Return | Flush Colour |
|---|---|---|---|---|
| 12.10 | 1.20 | Water | 100% | |
| 12.20 | 12.10 | Water | 75% | |
| 15.80 | 12.20 | Water | 75% | |

Installation

| Top (m) | Base (m) | Type | Dia (mm) |
|---|---|---|---|
| 0.00 | 10.00 | PLAIN | |
| 10.00 | 20.00 | SLOTTED | |

Fracture spacing as FI or Min, Average and Max in mm. TCR, SCR and RQD reported in %

IAN FARMER ASSOCIATES

| Contract Name: | | Client: | | | Borehole ID: |
|---|---|---|---|---|---|
| Thurnscoe | | Fairhurst | | | P07 |
| Contract Number: | Date Started: | Loggged By: | Checked By: | Status: | Sheet 1 of 1 |
| 41976 | 25/10/2016 | N/A | HH | DRAFT | |
| Rotary Core Drilling Log | Easting: | Northing: | Ground Level: | Plant Used: Comacchio 205 | Print Date: 15/12/2016 | Scale: 1:50 |
| Weather: | | Termination: | | | |

| Coring Details | | | | | Strata Details | | | | Groundwater | |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth | TCR | SCR | RQD | Fracture Spacing | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | Water Strike | Backfill/ Installation |
| | | | | | | 0.10 | | TOPSOIL (driller's description). | | |
| | | | | | | | | Brick fill (driller's description). | | |
| | | | | | | (1.10) | | | | |
| | | | | | | 1.20 | | MUDSTONE fill, open hole (driller's description). | | |
| | | | | | | | | | | |
| | | | | | | (2.10) | | | | |
| | | | | | | 3.30 | | Brick and concrete fill (driller's description). | | |
| | | | | | | | | | | |
| | | | | | | (4.20) | | | | |
| | | | | | | 7.50 | | End of Borehole at 7.500m | | |

1 2 3 4 5 6 7 8 9 10

| Start & End of Shift Observations | | | | | Borehole Diameter | | Casing Diameter | |
|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth (m) | Casing (m) | Water (m) | Depth (m) | Dia (mm) | Depth (m) | Dia (mm) |
| 25-10-2016 | 16:30 | 7.50 | | | 3.00 | 121 | 3.00 | 121 |
| | | | | | 7.50 | 92 | | |

| Flush Information | | | | | Installation | | | |
|---|---|---|---|---|---|---|---|---|
| Top (m) | Base (m) | Flush Type | Return | Flush Colour | Top (m) | Base (m) | Type | Dia (mm) |
| 3.30 | 1.20 | Air mist | 50% | | | | | |
| 7.50 | 3.30 | Air mist | 0% | | | | | |

Remarks:

Service inspection pit hand excavated from GL to 1.20m.

Water Strikes

| Strike (m) | Casing (m) | Sealed (m) | Time (mins) | Rose to (m) | Remarks |
|---|---|---|---|---|---|
| | | | | | |

Fracture spacing as FI or Min, Average and Max in mm. TCR, SCR and RQD reported in %

**Trial Pit Records**

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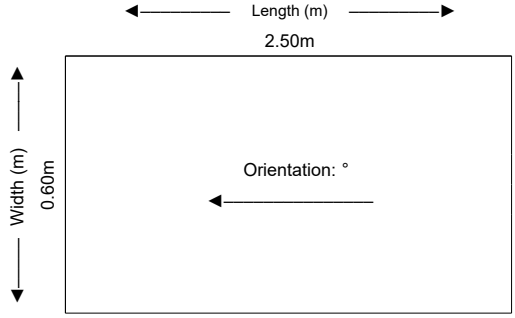
| Contract Name: | | Client: | | | Trial Pit ID: |
|---|---|---|---|---|---|
| Thurnscoe | | Fairhurst | | | TP01 |
| Contract Number: | Date: | Logged By: | Checked By: | Status: | Sheet 1 of 1 |
| 41976 | 17/10/2016 | BL | HH | DRAFT | |
| Trial Pit Log | Easting: | Northing: | Ground Level: | Plant Used: | Date Printed: / Scale: |
| | | | | JCB 3CX | 15/12/2016 / 1:40 |

Weather: | Hole Termination: | Stability: Trial pit remained dry and stable during excavation.

| Samples & In Situ Testing | | | Strata Details | | | | Water |
|---|---|---|---|---|---|---|---|
| Depths | Sample ID | Test Result | Reduced Level | Depth (m) (Thickness) | Legend | Strata Description | |
| 0.10 | D2 | | | 0.20 | | MADE GROUND: Grass over brown, slightly gravelly, clayey, fine to coarse SAND. Gravel is angular to subangular, fine to coarse including brick (Topsoil). | |
| 0.10 | ES1 | | | | | | |
| 0.40 - 1.00 | B3 | | | | | MADE GROUND: Black, sandy, angular to subangular, fine to coarse GRAVEL including brick, concrete, ash and coal. | |
| 0.50 | D5 | | | | | | |
| 0.50 | ES4 | | | | | | |
| 0.90 - 1.00 | B6 | | | | | | |
| 1.10 | D8 | | | | | | 1 |
| 1.10 | ES7 | | | | | | |
| | | | | | | *Below 1.40m: Clayey* | |
| 1.50 | B9 | | | | | | |
| 1.50 | D10 | | | | | | |
| 2.00 | D12 | | | | | | 2 |
| 2.00 | ES11 | | | (3.80) | | *Between 2.00m to 4.00m: Pockets of soft, laminated, yellowish brown clay* | |
| 2.50 | D14 | | | | | | |
| 2.50 - 3.00 | B13 | | | | | | |
| 3.00 | D15 | | | | | | 3 |
| 3.50 | D16 | | | | | | |
| 3.50 - 4.00 | B19 | | | | | | |
| 4.00 | D18 | | | 4.00 | | | |
| 4.00 | ES17 | | | | | End of Trial Pit at 4.00m | 4 |
| | | | | | | | 5 |
| | | | | | | | 6 |

## Dimensions:

Final Depth: 4.00m




## General Remarks:

| Water Strikes | | | |
|---|---|---|---|
| Strike (m) | Time (mins) | Rose to (m) | Remarks |
| | | | |

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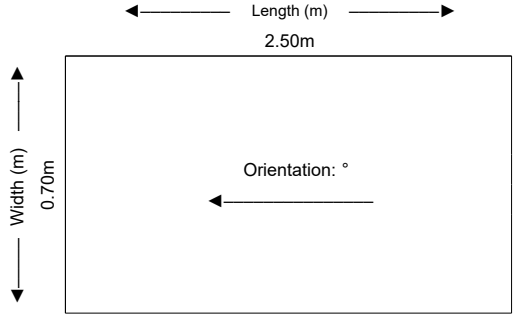
| Contract Name: | | Client: | | | Trial Pit ID: |
|---|---|---|---|---|---|
| Thurnscoe | | Fairhurst | | | TP02 |
| Contract Number: | Date: | Logged By: | Checked By: | Status: | Sheet 1 of 1 |
| 41976 | 17/10/2016 | BL | HH | DRAFT | |
| Trial Pit Log | Easting: | Northing: | Ground Level: | Plant Used: | Date Printed: / Scale: |
| | | | | JCB 3CX | 15/12/2016 / 1:40 |

Weather: | Hole Termination: | Stability: Trial pit remained dry and stable during excavation.

| Samples & In Situ Testing | | | Strata Details | | | | Water |
|---|---|---|---|---|---|---|---|
| Depths | Sample ID | Test Result | Reduced Level | Depth (m) (Thickness) | Legend | Strata Description | |
| 0.10<br>0.10 | D2<br>ES1 | | | 0.20 | | MADE GROUND: Brown, slightly gravelly, fine to coarse SAND. Gravel is angular to subrounded, fine to coarse including brick and concrete | |
| 0.50<br>0.50 | D4<br>ES3 | | | | | MADE GROUND: Dark grey to black, sandy, angular to subangular, fine to coarse GRAVEL including ash, brick, concrete and coal. | |
| 1.00<br>1.00 | D6<br>ES5 | | | | | | 1 |
| 1.50 | D7 | | | | | *Below 1.80m: High cobble content of brick* | |
| 2.00<br>2.00 | D9<br>ES8 | | | (3.80) | | | 2 |
| 2.50 | D10 | | | | | | |
| 3.00 | D11 | | | | | | 3 |
| 3.50 | D12 | | | | | | |
| 4.00<br>4.00 | D14<br>ES13 | | | 4.00 | | End of Trial Pit at 4.00m | 4 |
| | | | | | | | 5 |
| | | | | | | | 6 |

## Dimensions:

Final Depth: 4.00m




## General Remarks:

Water Strikes

| Strike (m) | Time (mins) | Rose to (m) | Remarks |
|---|---|---|---|
| | | | |

IAN FARMER ASSOCIATES

| Contract Name: | | Client: | | | Trial Pit ID: |
|---|---|---|---|---|---|
| Thurnscoe | | Fairhurst | | | TP03 |
| Contract Number: | Date: | Logged By: | Checked By: | Status: | Sheet 1 of 1 |
| 41976 | 17/10/2016 | BL | HH | DRAFT | |
| Trial Pit Log | Easting: | Northing: | Ground Level: | Plant Used: | Date Printed: / Scale: |
| | | | | JCB 3CX | 15/12/2016 / 1:40 |

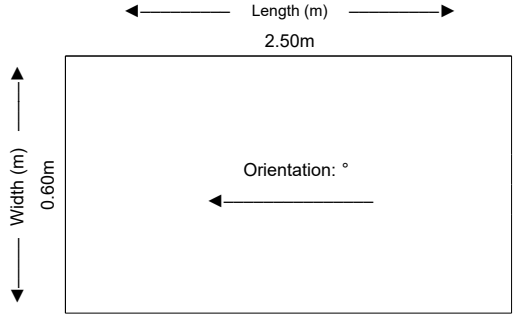
Weather: | Hole Termination: | Stability: Trial pit remained dry and stable during excavation.

| Samples & In Situ Testing | | | Strata Details | | | | Water |
|---|---|---|---|---|---|---|---|
| Depths | Sample ID | Test Result | Reduced Level | Depth (m) (Thickness) | Legend | Strata Description | |
| 0.20 | D2 | | | (0.30) | | MADE GROUND: Brown, gravelly, fine to coarse SAND. Gravel is angular to subangular, fine to coarse including brick (Topsoil). | |
| 0.20 | ES1 | | | 0.30 | | | |
| 0.50 | D5 | | | | | MADE GROUND: Black, sandy, angular to subangular, fine to coarse GRAVEL including ash, brick and mudstone. | |
| 0.50 | ES3 | | | | | | |
| 0.50 - 1.20 | B4 | | | | | | |
| 1.00 | D7 | | | | | | |
| 1.00 | ES6 | | | | | | |
| 1.50 | D8 | | | | | *Below 1.50m: Occasional pockets of clay.* | |
| 2.00 | D11 | | | | | | |
| 2.00 | ES9 | | | (3.70) | | | |
| 2.00 - 3.00 | B10 | | | | | | |
| 3.00 | D12 | | | | | | |
| 3.50 | D13 | | | | | | |
| 4.00 | D15 | | | 4.00 | | | |
| 4.00 | ES14 | | | | | End of Trial Pit at 4.00m | |

1 2 3 4 5 6

## Dimensions:

Final Depth: 4.00m




## General Remarks:

| Water Strikes | | | |
|---|---|---|---|
| Strike (m) | Time (mins) | Rose to (m) | Remarks |
| | | | |

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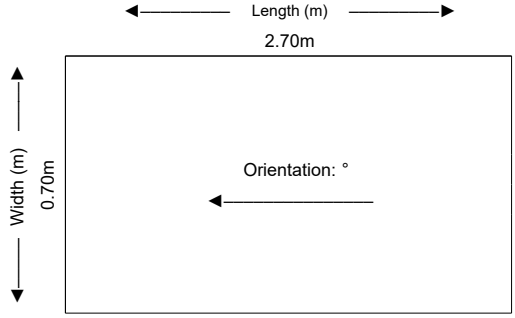
| Contract Name: | | Client: | | | Trial Pit ID: |
|---|---|---|---|---|---|
| Thurnscoe | | Fairhurst | | | TP04 |
| Contract Number: | Date: | Logged By: | Checked By: | Status: | Sheet 1 of 1 |
| 41976 | 17/10/2016 | BL | HH | DRAFT | |
| Trial Pit Log | Easting: | Northing: | Ground Level: | Plant Used: | Date Printed: / Scale: |
| | | | | JCB 3CX | 15/12/2016 / 1:40 |
| Weather: | Hole Termination: | Stability: Slight spalling of trial pit sides between 2m and 4m. Trial pit remained dry during excavation. | | | |

| Samples & In Situ Testing | | | Strata Details | | | | Water |
|---|---|---|---|---|---|---|---|
| Depths | Sample ID | Test Result | Reduced Level | Depth (m) (Thickness) | Legend | Strata Description | |
| 0.10 | D2 | | | 0.20 | | MADE GROUND: Brown, slightly gravelly, fine to coarse SAND with low cobble content. Gravel is angular to subangular, fine to coarse including brick. | |
| 0.10 | ES1 | | | | | | |
| 0.50 | D4 | | | (1.80) | | MADE GROUND: Black, sandy, angular to subangular, fine to coarse GRAVEL including ash, brick and mudstone | |
| 0.50 | ES3 | | | | | | |
| 1.00 | D6 | | | | | | |
| 1.00 | ES5 | | | | | | |
| 1.50 - 2.00 | B7 | | | | | | |
| 2.00 | D9 | | | 2.00 | | MADE GROUND: Black, sandy, angular to subangular, fine GRAVEL with low cobble content. Gravel includes brick. | |
| 2.00 | ES8 | | | | | | |
| 2.50 - 3.00 | B10 | | | (2.00) | | | |
| 3.00 | D12 | | | | | | |
| 3.00 | ES11 | | | | | | |
| 3.50 - 4.00 | B13 | | | | | | |
| 4.00 | D14 | | | 4.00 | | End of Trial Pit at 4.00m | |

1 2 3 4 5 6

## Dimensions:

Final Depth: 4.00m




## General Remarks:

| Water Strikes | | | |
|---|---|---|---|
| Strike (m) | Time (mins) | Rose to (m) | Remarks |
| | | | |

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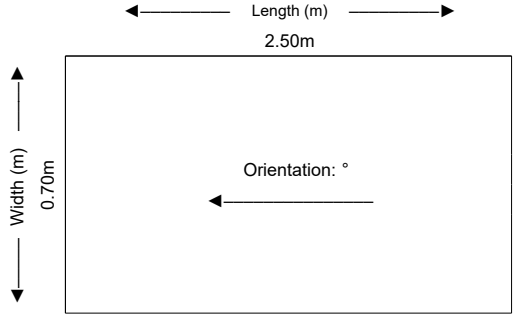
| Contract Name: | | Client: | | | Trial Pit ID: |
|---|---|---|---|---|---|
| Thurnscoe | | Fairhurst | | | TP05 |
| Contract Number: | Date: | Logged By: | Checked By: | Status: | Sheet 1 of 1 |
| 41976 | 18/10/2016 | BL | HH | DRAFT | |
| Trial Pit Log | Easting: | Northing: | Ground Level: | Plant Used: | Date Printed: / Scale: |
| | | | | JCB 3CX | 15/12/2016 / 1:40 |

Weather: | Hole Termination: | Stability: Trial pit remained dry and stable during excavation.

| Samples & In Situ Testing | | | Strata Details | | | | Water |
|---|---|---|---|---|---|---|---|
| Depths | Sample ID | Test Result | Reduced Level | Depth (m) (Thickness) | Legend | Strata Description | |
| 0.10<br>0.10<br>0.10 - 0.40 | D3<br>ES1<br>B2 | | | (0.50) | | MADE GROUND: Brown, gravelly, fine to coarse SAND. Gravel is angular to subangular, fine to coarse including brick (Topsoil). | |
| 0.50<br>0.50 | D5<br>ES4 | | | 0.50 | | MADE GROUND: Black, slightly clayey, sandy, angular to subangular, fine to medium GRAVEL of mudstone, ash and coal. | |
| 1.00<br>1.00<br>1.00 - 2.00 | D8<br>ES6<br>B7 | | | | | | 1 |
| 2.00<br>2.00 | D10<br>ES9 | | | (3.50) | | | 2 |
| 3.00<br>3.00 - 4.00 | D12<br>B11 | | | | | | 3 |
| 4.00<br>4.00 | D14<br>ES13 | | | 4.00 | | End of Trial Pit at 4.00m | 4 |
| | | | | | | | 5 |
| | | | | | | | 6 |

## Dimensions:

Final Depth: 4.00m




## General Remarks:

| Water Strikes | | | |
|---|---|---|---|
| Strike (m) | Time (mins) | Rose to (m) | Remarks |
| | | | |

IAN FARMER ASSOCIATES

| Contract Name: | | Client: | | | Trial Pit ID: |
|---|---|---|---|---|---|
| Thurnscoe | | Fairhurst | | | TP06 |
| Contract Number: | Date: | Logged By: | Checked By: | Status: | Sheet 1 of 1 |
| 41976 | 18/10/2016 | BL | HH | DRAFT | |
| Trial Pit Log | Easting: | Northing: | Ground Level: | Plant Used: | Date Printed: / Scale: |
| | | | | JCB 3CX | 15/12/2016 / 1:40 |

Weather:

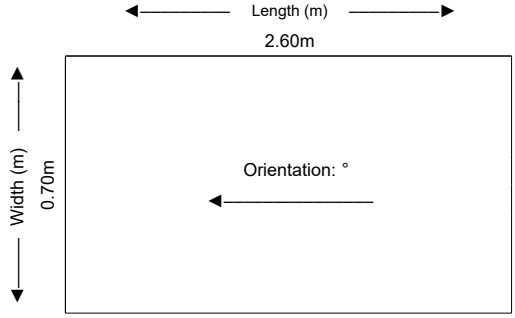
Hole Termination:

Stability: Slight spalling of trial pit sides between 0.90m and 2.30m.
Trial pit remained dry during excavation.

| Samples & In Situ Testing | | | Strata Details | | | | Water |
|---|---|---|---|---|---|---|---|
| Depths | Sample ID | Test Result | Reduced Level | Depth (m) (Thickness) | Legend | Strata Description | |
| 0.10<br>0.10 | D2<br>ES1 | | | (0.50) | | MADE GROUND: Brown, gravelly, fine to coarse SAND. Gravel is angular to subangular, fine to coarse of brick | |
| 0.50 - 1.50 | B3 | | | 0.50 | | MADE GROUND: Black, sandy, angular to subangular, fine and medium GRAVEL with low cobble content including brick, ash and coal. | |
| 1.00<br>1.00 | D5<br>ES4 | | | (1.60) | | | 1 |
| 2.00<br>2.00<br>2.00 - 3.00 | D8<br>ES6<br>B7 | | | 2.10 | | MADE GROUND: Black, clayey, angular to subangular, fine to coarse GRAVEL including mudstone and coal. | 2 |
| 3.00<br>3.00 | D10<br>ES9 | | | (1.40) | | At 3.00m: Band of grey clay | 3 |
| | | | | 3.50 | | MADE GROUND: Black, sandy, angular to subangular, fine and medium GRAVEL of ash, coal and mudstone | |
| 4.00 | ES11 | | | (0.50)<br>4.00 | | End of Trial Pit at 4.00m | 4 |
| | | | | | | | 5 |
| | | | | | | | 6 |

Dimensions:

Final Depth: 4.00m




General Remarks:

| Water Strikes | | | |
|---|---|---|---|
| Strike (m) | Time (mins) | Rose to (m) | Remarks |
| | | | |

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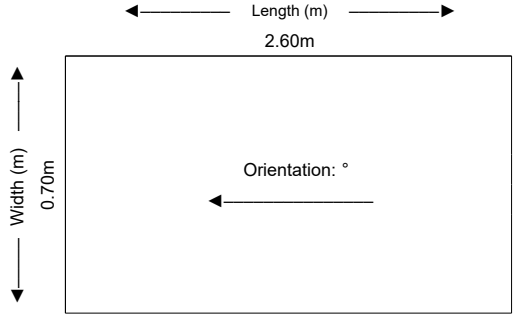
| Contract Name: | | Client: | | | Trial Pit ID: |
|---|---|---|---|---|---|
| Thurnscoe | | Fairhurst | | | TP07 |
| Contract Number: | Date: | Logged By: | Checked By: | Status: | Sheet 1 of 1 |
| 41976 | 18/10/2016 | BL | HH | DRAFT | |
| Trial Pit Log | Easting: | Northing: | Ground Level: | Plant Used: | Date Printed: / Scale: |
| | | | | JCB 3CX | 15/12/2016 / 1:40 |

Weather: | Hole Termination: | Stability: Trial pit remained dry and stable during excavation.

| Samples & In Situ Testing | | | Strata Details | | | | Water |
|---|---|---|---|---|---|---|---|
| Depths | Sample ID | Test Result | Reduced Level | Depth (m) (Thickness) | Legend | Strata Description | |
| 0.10 | D2 | | | | | MADE GROUND: Slightly gravelly, fine to coarse SAND. Gravel is angular to subangular, fine to coarse including brick (Topsoil). | |
| 0.10 | ES1 | | | (0.30) | | | |
| 0.30 - 0.40 | B3 | | | 0.30 | | MADE GROUND: Concrete, recovered as angular, medium to coarse GRAVEL. | |
| | | | | 0.40 | | MADE GROUND: Black, clayey, angular to subangular, fine to coarse GRAVEL of coal, ash, mudstone and brick | |
| 0.50 | D6 | | | | | | |
| 0.50 | ES4 | | | | | | |
| 0.50 - 1.50 | B5 | | | | | | |
| 1.00 | D8 | | | | | | 1 |
| 1.00 | ES7 | | | (1.60) | | | |
| | | | | 2.00 | | MADE GROUND: Firm, friable, multicoloured gravelly, sandy CLAY. Gravel is angular to subangular, fine to coarse including mudstone and coal | 2 |
| 2.10 - 2.20 | B9 | | | (0.30) | | | |
| 2.20 | D11 | | | 2.30 | | MADE GROUND: Firm, friable, black, gravelly CLAY. Gravel is angular to subangular, fine to coarse including mudstone, coal and igneous lithologies. | |
| 2.20 | ES10 | | | | | | |
| 3.00 | D14 | | | | | | 3 |
| 3.00 | ES12 | | | (1.70) | | | |
| 3.00 - 4.00 | B13 | | | | | | |
| 4.00 | B15 | | | 4.00 | | End of Trial Pit at 4.00m | 4 |
| | | | | | | | 5 |
| | | | | | | | 6 |

## Dimensions:

Final Depth: 4.00m




## General Remarks:

Water Strikes

| Strike (m) | Time (mins) | Rose to (m) | Remarks |
|---|---|---|---|
| | | | |

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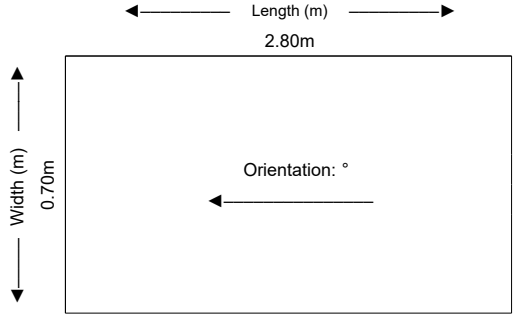
| Contract Name: | | Client: | | | Trial Pit ID: |
|---|---|---|---|---|---|
| Thurnscoe | | Fairhurst | | | TP08 |
| Contract Number: | Date: | Logged By: | Checked By: | Status: | Sheet 1 of 1 |
| 41976 | 18/10/2016 | BL | HH | DRAFT | |
| Trial Pit Log | Easting: | Northing: | Ground Level: | Plant Used: | Date Printed: / Scale: |
| | | | | JCB 3CX | 15/12/2016 / 1:40 |

Weather: | Hole Termination: | Stability: Trial pit remained dry and stable during excavation.

| Samples & In Situ Testing | | | Strata Details | | | | Water |
|---|---|---|---|---|---|---|---|
| Depths | Sample ID | Test Result | Reduced Level | Depth (m) (Thickness) | Legend | Strata Description | |
| 0.10 | D2 | | | 0.20 | | MADE GROUND: Brown, gravelly, fine to coarse SAND. Gravel is angular to subangular, fine to coarse include brick | |
| 0.10 | ES1 | | | | | | |
| 0.30 | D4 | | | 0.40 | | MADE GROUND: Grey, friable, gravelly CLAY. Gravel is angular to subangular, fine to coarse including mudstone | |
| 0.30 | ES3 | | | | | | |
| 0.40 - 0.90 | B5 | | | (0.50) | | MADE GROUND: Orange and red, clayey, angular to subangular, fine to coarse GRAVEL including mudstone. | |
| 0.80 | D7 | | | 0.90 | | | |
| 0.80 | ES6 | | | | | MADE GROUND: Grey, angular to subangular, fine to coarse GRAVEL of mudstone. | 1 |
| | | | | 1.10 | | | |
| 1.20 - 2.00 | B8 | | | | | MADE GROUND: Black, clayey, angular to subangular, fine to coarse GRAVEL including coal and mudstone. | |
| 1.50 | D9 | | | (1.60) | | | |
| 2.00 | D11 | | | | | | 2 |
| 2.00 | ES10 | | | | | | |
| 2.50 | D12 | | | 2.70 | | | |
| | | | | | | MADE GROUND: Black, sandy, angular to subangular, fine and medium GRAVEL including ash and coal. | |
| 3.00 | D15 | | | | | | 3 |
| 3.00 | ES13 | | | | | | |
| 3.00 - 4.00 | B14 | | | (1.30) | | | |
| 4.00 | D16 | | | 4.00 | | End of Trial Pit at 4.00m | 4 |
| | | | | | | | 5 |
| | | | | | | | 6 |

## Dimensions:

Final Depth: 4.00m




## General Remarks:

| Water Strikes | | | |
|---|---|---|---|
| Strike (m) | Time (mins) | Rose to (m) | Remarks |
| | | | |

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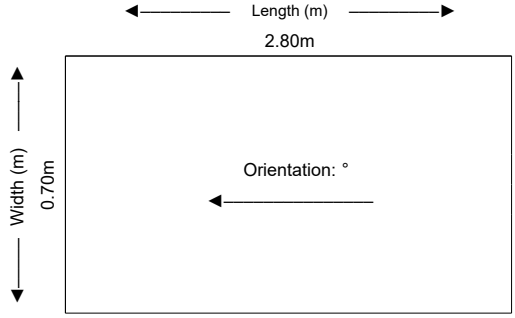
| Contract Name: | | Client: | | | Trial Pit ID: |
|---|---|---|---|---|---|
| Thurnscoe | | Fairhurst | | | TP09 |
| Contract Number: | Date: | Logged By: | Checked By: | Status: | Sheet 1 of 1 |
| 41976 | 18/10/2016 | BL | HH | DRAFT | |
| Trial Pit Log | Easting: | Northing: | Ground Level: | Plant Used: | Date Printed: / Scale: |
| | | | | JCB 3CX | 15/12/2016 / 1:40 |

Weather: | Hole Termination: | Stability: Trial pit remained dry and stable during excavation.

| Samples & In Situ Testing | | | Strata Details | | | | Water |
|---|---|---|---|---|---|---|---|
| Depths | Sample ID | Test Result | Reduced Level | Depth (m) (Thickness) | Legend | Strata Description | |
| 0.10 | D2 | | | 0.20 | | MADE GROUND: Brown, gravelly, fine to coarse SAND. Gravel is angular to subangular, fine to coarse including brick. | |
| 0.10 | ES1 | | | | | MADE GROUND: Black, friable, gravelly CLAY. Gravel is angular to subangular, fine to coarse including mudstone and coal | |
| 0.50 - 1.00 | B3 | | | | | | |
| 0.80 | D5 | | | | | | |
| 0.80 | ES4 | | | (1.50) | | | 1 |
| 1.80 | D6 | | | 1.70 | | MADE GROUND: Black, sandy fine to medium GRAVEL of ash and coal | |
| 2.00 | D8 | | | | | | 2 |
| 2.00 | ES7 | | | | | | |
| 2.50 - 3.00 | B9 | | | | | | |
| 3.00 | D11 | | | (2.30) | | | 3 |
| 3.00 | ES10 | | | | | | |
| 3.50 - 4.00 | B12 | | | | | | |
| 4.00 | D14 | | | 4.00 | | | 4 |
| 4.00 | ES13 | | | | | End of Trial Pit at 4.00m | |
| | | | | | | | 5 |
| | | | | | | | 6 |

## Dimensions:

Final Depth: 4.00m




## General Remarks:

| Water Strikes | | | |
|---|---|---|---|
| Strike (m) | Time (mins) | Rose to (m) | Remarks |
| | | | |

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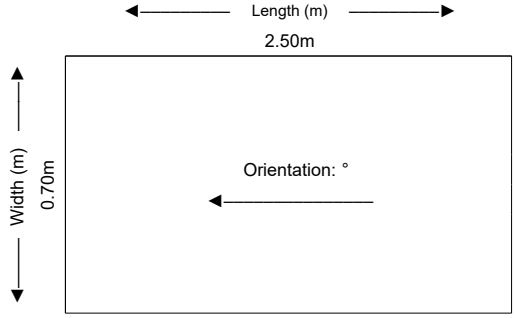
| Contract Name: | | Client: | | | Trial Pit ID: |
|---|---|---|---|---|---|
| Thurnscoe | | Fairhurst | | | TP10 |
| Contract Number: | Date: | Logged By: | Checked By: | Status: | Sheet 1 of 1 |
| 41976 | 17/10/2016 | BL | HH | DRAFT | |
| Trial Pit Log | Easting: | Northing: | Ground Level: | Plant Used: | Date Printed: / Scale: |
| | | | | JCB 3CX | 15/12/2016 / 1:40 |

Weather: | Hole Termination: | Stability: Trial pit remained stable during excavation.

| Samples & In Situ Testing | | | Strata Details | | | | Water |
|---|---|---|---|---|---|---|---|
| Depths | Sample ID | Test Result | Reduced Level | Depth (m) (Thickness) | Legend | Strata Description | |
| 0.10 | D2 | | | (0.30) | | MADE GROUND: Brown, slightly gravelly, clayey, fine to coarse SAND. Gravel is angular to subangular, fine and medium including brick and concrete (Topsoil). | |
| 0.10 | ES1 | | | 0.30 | | | |
| 0.50 | D5 | | | | | MADE GROUND: Dark grey, clayey, gravelly, fine to coarse SAND. Gravel is angular to subangular, fine to coarse including brick, ash and coal | |
| 0.50 | ES3 | | | | | | |
| 0.50 - 1.20 | B4 | | | (1.30) | | | |
| 1.10 | D7 | | | | | | 1 |
| 1.10 | ES6 | | | | | | |
| 1.50 | D8 | | | 1.60 | | | |
| 1.70 - 2.00 | B9 | | | (0.50) | | MADE GROUND: Black, sandy, angular to subangular, fine GRAVEL of ash, coal, brick and concrete. | |
| 2.00 | D11 | | | 2.10 | | | 2 |
| 2.00 | ES10 | | | | | MADE GROUND: Dark grey, gravelly, clayey, fine and medium SAND. Gravel is angular to subangular, fine and medium brick, ash, coal and concrete | |
| 2.40 | D12 | | | (0.80) | | | |
| 2.90 - 3.50 | B13 | | | 2.90 | | MADE GROUND: Black, gravelly, medium and coarse SAND. Gravel is angular to subangular, fine to coarse including ash, brick and coal | |
| 3.00 | D14 | | | (1.10) | | | 3 |
| 4.00 | D16 | | | 4.00 | | End of Trial Pit at 4.00m | 4 |
| 4.00 | ES15 | | | | | | |
| | | | | | | | 5 |
| | | | | | | | 6 |

## Dimensions:

Final Depth: 4.00m




## General Remarks:

Water Strikes

| Strike (m) | Time (mins) | Rose to (m) | Remarks |
|---|---|---|---|
| 4.00 | 0 | 0.00 | seepage |

# APPENDIX 3

# GEOTECHNICAL LABORATORY TEST RESULTS

## APPENDIX 3

## GENERAL NOTES ON LABORATORY TESTS ON SOILS

### A3.1 GENERAL

A3.1.1 Where applicable all tests are carried out in accordance with the relevant British Standard. The laboratory test procedures are as below:

| Test Name | Procedures BS1377:1990 Part:Clause |
|---|---|
| Moisture Content | 2:3 |
| Liquid Limit | 2:4 |
| Plastic Limit and Plastic Index | 2:5 |
| Linear Shrinkage | 2:6 |
| Particle Size Distribution | 2:9 |
| Loss on Ignition | 3:4* |
| Sulphate content | 3:5 |
| Chloride Content | 3:7* |
| pH Value | 3:9 |
| Compaction Test | 4:3* |
| Moisture condition Value | 4:5 |
| California Bearing Ratio | 4:7 |
| Consolidation | 5:3 |
| Bulk Density | 7:2* |
| Laboratory Vane Tests | 7:3* |
| Shear Box | 7:4* |
| Triaxial Compression | |
| Total Stress Single-Stage | 7:8 |
| Total Stress Multi-Stage | 7:9 |
| Effective Stress | Note 1* |
| Permeability | Note 2* |
| Desiccation | Note 3* |
| In-situ density by Sand replacement | Part 9 |
| Core Cutter | Part 9 |
| Nuclear density | Part 9 |

| | BS812 Part:Clause |
|---|---|
| Ten % fines (Dry and Soaked) | 111 |
| Aggregate crushing value | 110 |
| Particle density and water absorption | 2 |
| Particle size distribution | 103 |
| Moisture content – oven drying | 109 |
| Soundness | 121 |

| | BS:1881 Part:Clause |
|---|---|
| Chloride Content | 124:10.2 |
| Sulphate content | 124:10.3 |
| Curing/density and compressive strength of concrete tubes | 116-111-114 |
| Location of reinforcement | 204 |
| Carbonation | Note 4 |
| Resistivity | Note 5 |
| Sampling of concrete dust by drilling | Note 6 |
| Half cell potential | Note 7 |

Note 1 - Manual of soils laboratory testing volume 3: 1985, section 19.2 by K.H. Head
Note 2 - Manual of soils laboratory testing volume 2: 1985, section 10.7 by K.H. Head
Note 3 - BRE Information paper IP4 issued February 1993
Note 4 - BRE Information paper IP6/81
Note 5 - In-house document number 109
Note 6 - In-house document number 112
Note 7 - ASTM C876-91
* Tests are not included in UKAS accreditation

A3.1.2 Any discussion in this report is based on the values and results obtained from the appropriate tests. Due allowance should be made, when considering any result in isolation, of the possible inaccuracy of any such individual result. Details of the accuracy of results are included in this section, where applicable.

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Unit 4 Faraday Close, Pattinson North Industrial Estate, Washington, Tyne & Wear, NE38 8QJ
Tel. 0191 482 8500 Fax. 0191 482 8520 Email. washington@ianfarmer.co.uk Internet. www.ianfarmer.co.uk

F.A.O.

# Test Report - 41976 /1

| | |
|---|---|
| Site: | Thurnscoe |
| Job Number: | 41976 |
| Originating Client: | Fairhurst |
| Originating Reference: | 41976 |
| Date Sampled: | Not Given |
| Date Scheduled: | 02/11/2016 |
| Date Testing Started: | 09/11/2016 |
| Date Testing Finished: | 23/11/2016 |
| Remarks: | |

Authorised By: D. Smith

Daniel Smith
Laboratory Supervisor

Date: 25/11/2016



constructionline
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Motherwell (01698) 230 231. Newcastle upon Tyne (0191) 482 8500. Truro (01827) 261 775.
Warrington (01925) 855 440.

AGS ASSOCIATION OF GEOTECHNICAL & GEOENVIRONMENTAL SPECIALISTS

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**Laboratory Test Report** | 41976 / 1

**Site:** Thurnscoe **Job Number:** 41976

**Client:** Fairhurst **Page:** 2

## Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

| Borehole / Trial Pit | Depth (m) | Sample | Natural / Sieved | Natural Water Content % | Sample Passing 425 µm Sieve | | Liquid Limit % | Plastic Limit % | Plasticity Index % | Liquidity Index | Class | Description / Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Percentage % | Water Content % | | | | | | |
| BH01 | 5.00 | U16 | | 19.9 | | | | | | | | Grey CLAY |
| BH01 | 5.50 | D17 | Natural | 18.9 | 100 | 19.0 | 42 | 21 | 21 | -0.10 | CI | Brown / Grey sandy CLAY |
| TP01 | 0.40 | B3 | | 13.9 | | | | | | | | Brown gravelly SAND |
| TP02 | 1.50 | D7 | | 12.8 | | | | | | | | Black gravelly SAND |
| TP03 | 0.50 | B4 | | 18 | | | | | | | | Black gravelly clayey SAND |
| TP05 | 0.10 | B2 | | 13.8 | | | | | | | | Brown clayey gravelly SAND |
| TP06 | 0.50 | B3 | | 18.5 | | | | | | | | Black clayey gravelly SAND |
| TP07 | 0.60 | B | | 20.8 | | | | | | | | Brown sandy gravelly CLAY |
| TP08 | 0.30 | D4 | | 14.6 | | | | | | | | Grey sandy gravelly CLAY |

**Method of Preparation:** BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS 1377 : Part 1 : 2016 : Clause 8.4.3 Preparation of samples for plasticity tests
BS 1377 : Part 2 : 1990 : Clause 4.2 Preparation of samples for plastic limit tests

**Method of Test:** BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS 1377 : Part 2 : 1990 : Clause 4.3 or 4.4 Determination of the liquid limit
BS 1377 : Part 2 : 1990 : Clause 5.3 Determination of the plastic limit and plasticity index

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| Laboratory Test Report | 41976 / 1 |
|---|---|

**Site:** Thurnscoe **Job Number:** 41976

**Client:** Fairhurst **Page:** 3

## Determination of Particle Density by Gas Jar Method

| Borehole / Trial Pit | Depth (m) | Sample | Particle Density Mg/m3 | Description / Remarks |
|---|---|---|---|---|
| TP09 | 0.50 | B3 | 2.49 | Brown sandy gravelly CLAY |

**Method of Preparation:** BS 1377 : Part 1 : 2016 : Clause 8.3 Initial preparation of disturbed samples
BS 1377 : Part 1 : 2016 : Clause 8.4.4 Preparation of samples for particle density tests

**Method of Test:** BS 1377 : Part 2 : 1990 : Clause 8.2 Determination of particle density (Gas jar method)

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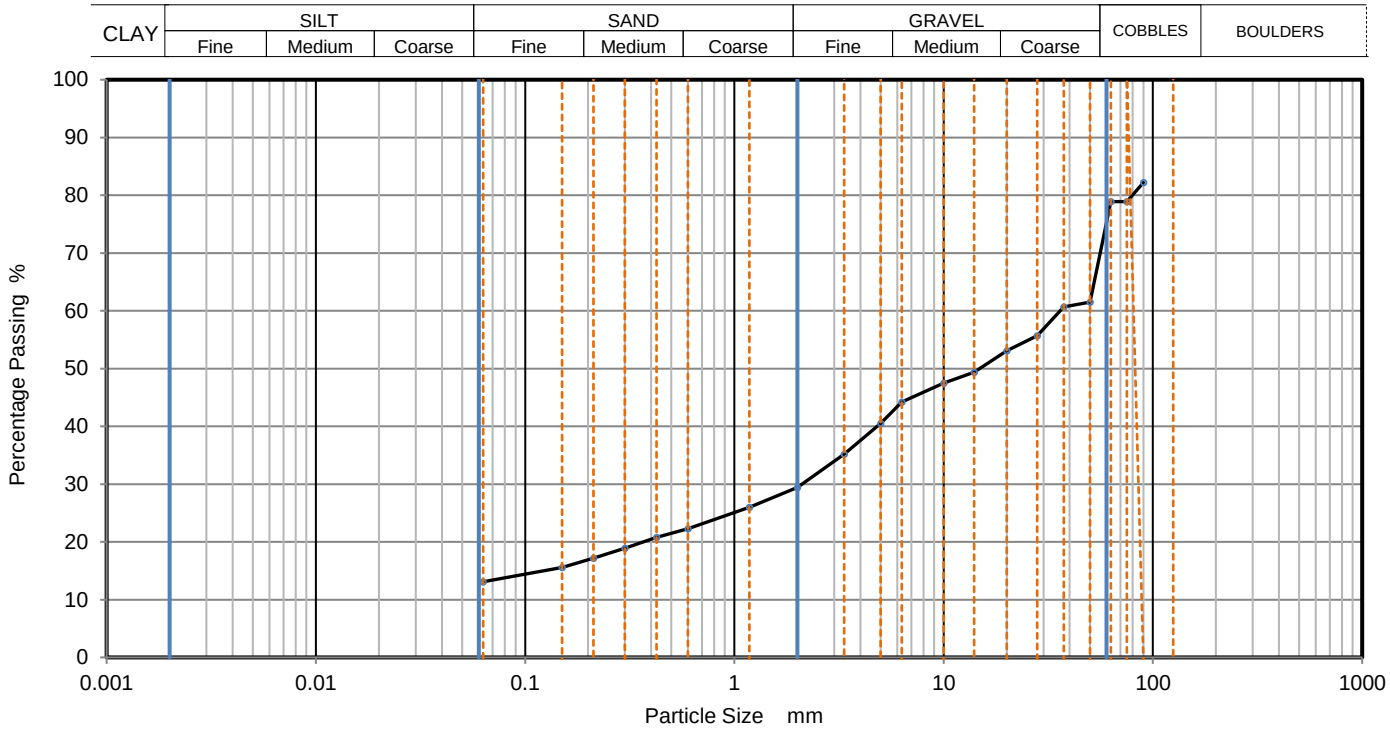
**Laboratory Test Report** | 41976 / 1

**Site:** Thurnscoe | **Job Number:** 41976

**Client:** Fairhurst | **Page:** 4

# DETERMINATION OF PARTICLE SIZE DISTRIBUTION

| Borehole / Trial Pit | Depth (m) | Sample | Testing Type | Description |
|---|---|---|---|---|
| TP04 | 1.50 | B7 | Wet Sieve | Black gravelly SAND |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | | |
| 90 | 82 | | |
| 75 | 79 | | |
| 63 | 79 | | |
| 50 | 62 | | |
| 37.5 | 61 | | |
| 28 | 56 | | |
| 20 | 53 | | |
| 14 | 49 | | |
| 10 | 48 | | |
| 6.3 | 44 | | |
| 5 | 41 | | |
| 3.35 | 35 | | |
| 2 | 29 | | |
| 1.18 | 26 | | |
| 0.6 | 22 | | |
| 0.425 | 21 | | |
| 0.3 | 19 | | |
| 0.212 | 17 | | |
| 0.15 | 16 | | |
| 0.063 | 13 | | |

Dry Mass of sample, g: 10607

| Sample Proportions | % dry mass |
|---|---|
| Very coarse | 21 |
| Gravel | 50 |
| Sand | 16 |
| | |
| Fines <0.063mm | 13 |

| Grading Analysis | | |
|---|---|---|
| D100 | mm | 125 |
| D60 | mm | 36 |
| D30 | mm | 2.1 |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

**Method of Preparation:** BS 1377:Part 1:1990, clause 7 3 Initial preparation
BS 1377:Part 1:1990, clause 7.4.5 Preparation of particle size tests

**Method of Test:** BS1377:Part 2:1990, clause 9.2 Determination of particle size distribution by wet sieving method

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| IAN FARMER ASSOCIATES | Laboratory Test Report | 41976 / 1 |
|---|---|---|

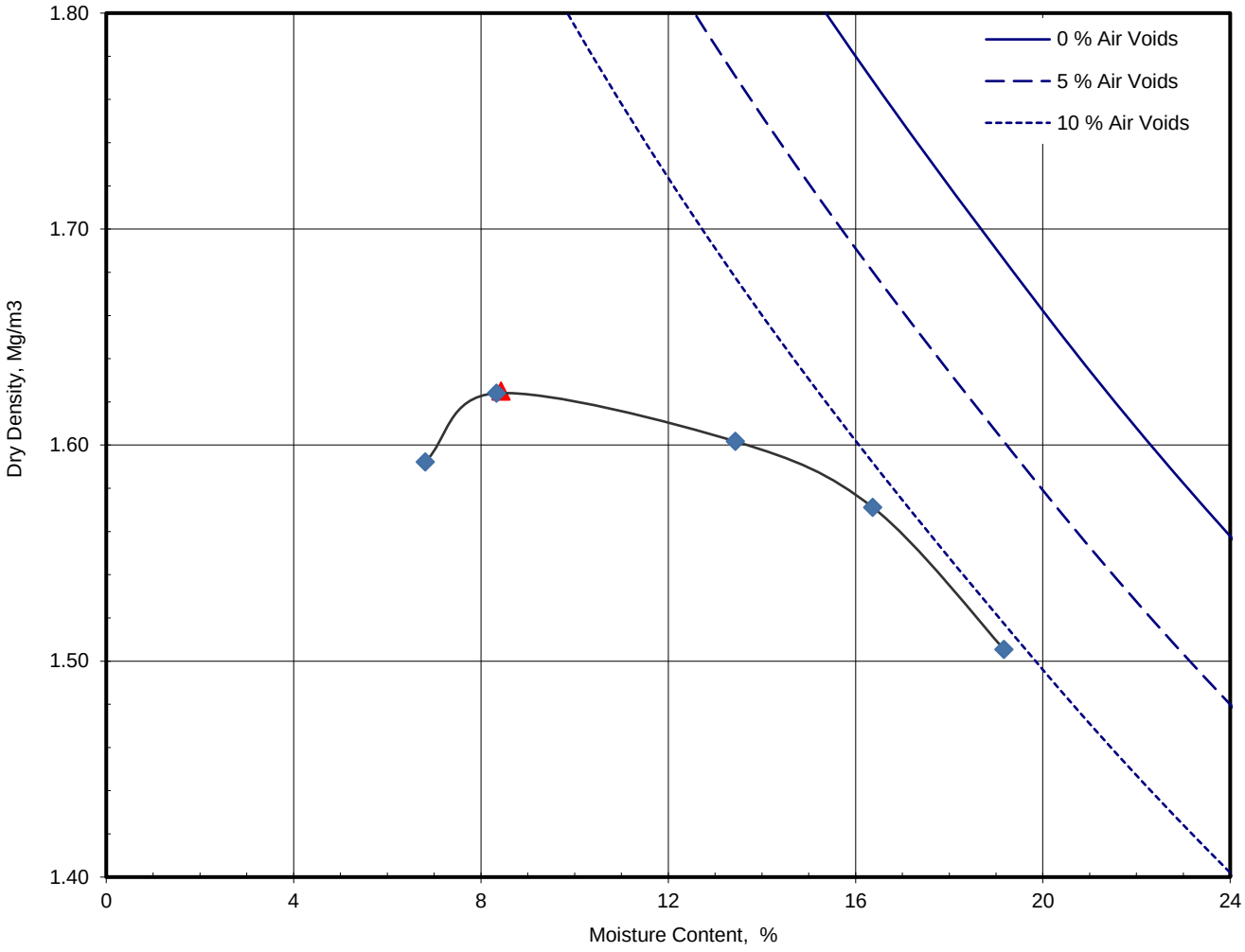
**Site:** Thurnscoe **Job Number:** 41976

**Client:** Fairhurst **Page:** 5

## DETERMINATION OF DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

| Borehole / Trial Pit | Depth (m) | Sample | Description |
|---|---|---|---|
| TP03 | 0.5 | B4 | Black gravelly clayey SAND |

| | | | |
|---|---|---|---|
| Percentage Retained 37.5mm | 10 % | | |
| Percentage Retained 20.0mm | 9 % | Samples Used | Single sample tested |
| Grading Zone | 5 | Particle Density | 2.49 Mg/m³ Assumed |
| Mould Type | CBR | Method of compaction | Compaction using 4.5kg rammer |
| **Maximum Dry Density** | **1.62 Mg/m³** | **Optimum Moisture Content** | **8.4 %** |




Method of Preparation: BS 1377:PART 1:1990:7.6 Preparation of samples for compaction related test
BS 1377:PART 4:1990:3.2 Preparation of samples for compaction tests

Preparation Details: Material used was air dried. Single sample tested

Method of Test: BS1377:Part 4:1990, clause 3.4, 4.5kg rammer

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| IAN FARMER ASSOCIATES | Laboratory Test Report | 41976 / 1 |
|---|---|---|

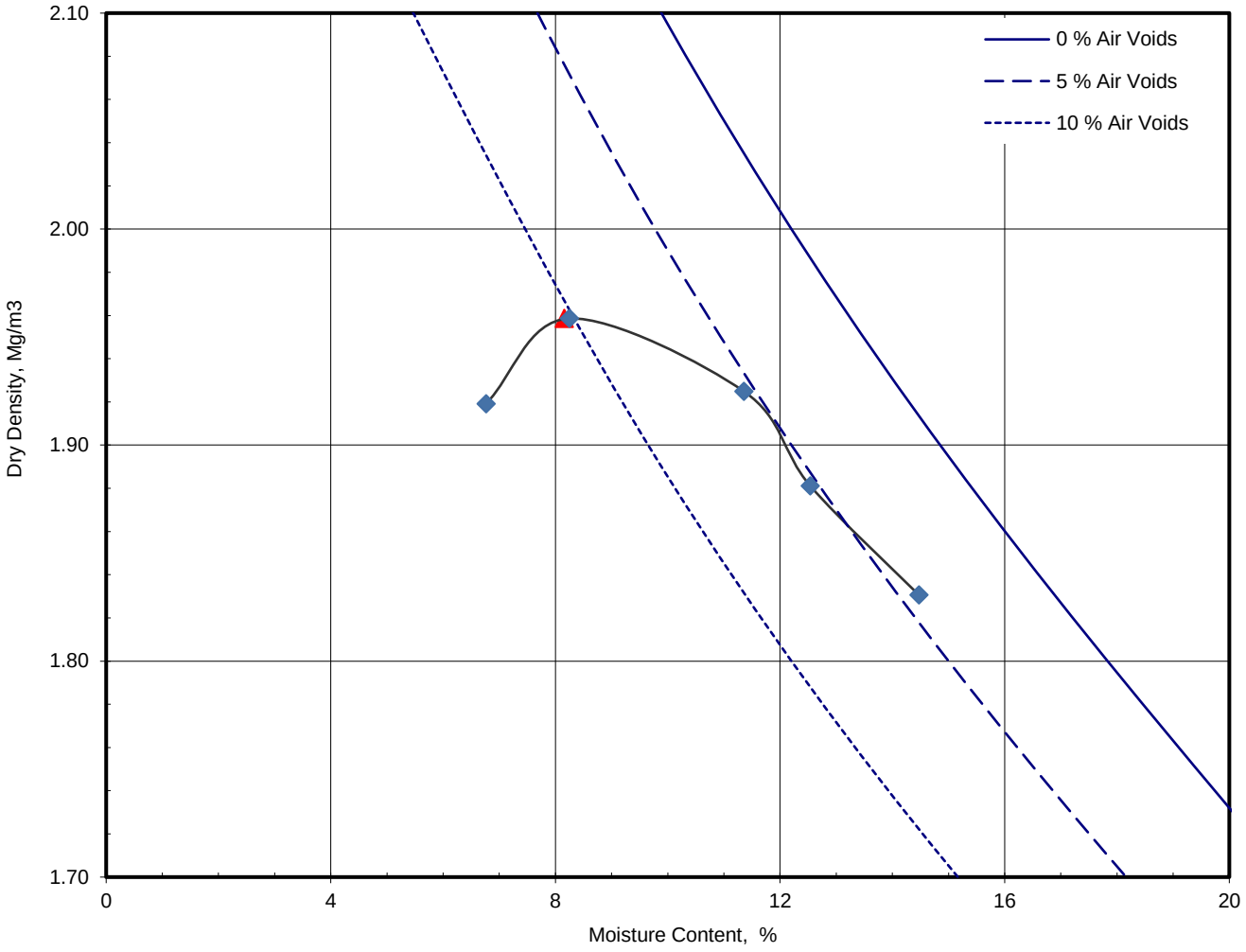
**Site:** Thurnscoe **Job Number:** 41976

**Client:** Fairhurst **Page:** 6

## DETERMINATION OF DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

| Borehole / Trial Pit | Depth (m) | Sample | Description |
|---|---|---|---|
| TP05 | 0.1 | B2 | Brown clayey gravelly SAND |

| | | | |
|---|---|---|---|
| Percentage Retained 37.5mm | 0 % | | |
| Percentage Retained 20.0mm | 7 % | Samples Used | Single sample tested |
| Grading Zone | 3 | Particle Density | 2.65 Mg/m³ Assumed |
| Mould Type | 1 LITRE | Method of compaction | Compaction using 4.5kg rammer |
| **Maximum Dry Density** | **1.96 Mg/m³** | **Optimum Moisture Content** | **8.2 %** |




Method of Preparation: BS 1377:PART 1:1990:7.6 Preparation of samples for compaction related test
BS 1377:PART 4:1990:3.2 Preparation of samples for compaction tests

Preparation Details: Material used was air dried. Single sample tested

Method of Test: BS1377:Part 4:1990, clause 3.3, 4.5kg rammer

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| Laboratory Test Report | 41976 / 1 |
|---|---|

**Site:** Thurnscoe **Job Number:** 41976

**Client:** Fairhurst **Page:** 7

# Determination of California Bearing Ratio ( CBR )

| Borehole / Trial Pit | Depth (m) | Sample | % Passing 20mm Sieve | Description |
|---|---|---|---|---|
| TP01 | 0.40 | **B3** | **76.50%** | Brown gravelly SAND |

**Specimen Preparation**

Condition: REMOULDED

Details: Recompacted with specified standard effort using 2.5kg rammer

Initial Specimen details

| | | |
|---|---|---|
| Bulk density | 1.83 | Mg/m3 |
| Dry density | 1.59 | Mg/m3 |
| Moisture content | 14.9 | % |

Soaking details: Not soaked

Period of soaking: days

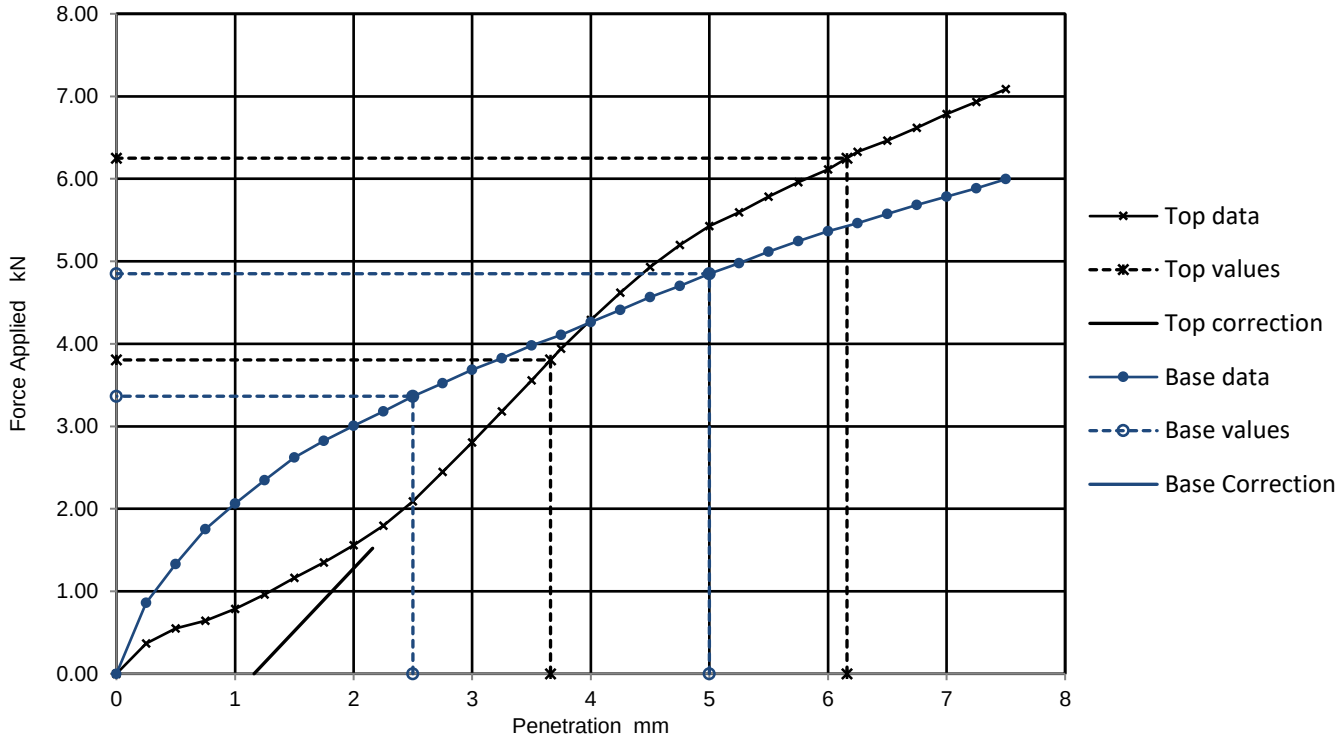
Time to surface: days

Amount of swell recorded: mm

Dry density after soaking: Mg/m3

Surcharge applied: 4.2 kg / 3 kPa

**Force v Penetration Plots**




RESULTS

| | Curve correction applied | CBR Values, % 2.5mm | 5mm | Highest | Average | Moisture Content % |
|---|---|---|---|---|---|---|
| TOP | Yes | 29.0 | 31.0 | 31.0 | | 15.3 |
| BASE | No | 25.0 | 24.0 | 25.0 | | 14.1 |

| Approved |
|---|
| Daniel Smith |

Method of Preparation: BS1377 : Part 4 : 1990, clause 7. Recompacted with specified standard effort using 2.5kg rammer

Method of Test: BS1377 : Part 4 : 1990, clause 7. Determination of California Bearing Ratio (CBR)

Remarks:

UKAS TESTING 1464

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| Laboratory Test Report | 41976 / 1 |
|---|---|

**Site:** Thurnscoe **Job Number:** 41976

**Client:** Fairhurst **Page:** 8

# Determination of California Bearing Ratio ( CBR )

| Borehole / Trial Pit | Depth (m) | Sample | % Passing 20mm Sieve | Description |
|---|---|---|---|---|
| TP06 | 0.50 | **B3** | **89.40%** | Black clayey gravelly SAND |

**Specimen Preparation**

Condition: REMOULDED

Details: Recompacted with specified standard effort using 2.5kg rammer

Initial Specimen details

| | | |
|---|---|---|
| Bulk density | 1.79 | Mg/m3 |
| Dry density | 1.51 | Mg/m3 |
| Moisture content | 18.7 | % |

Soaking details: Not soaked

Period of soaking: days

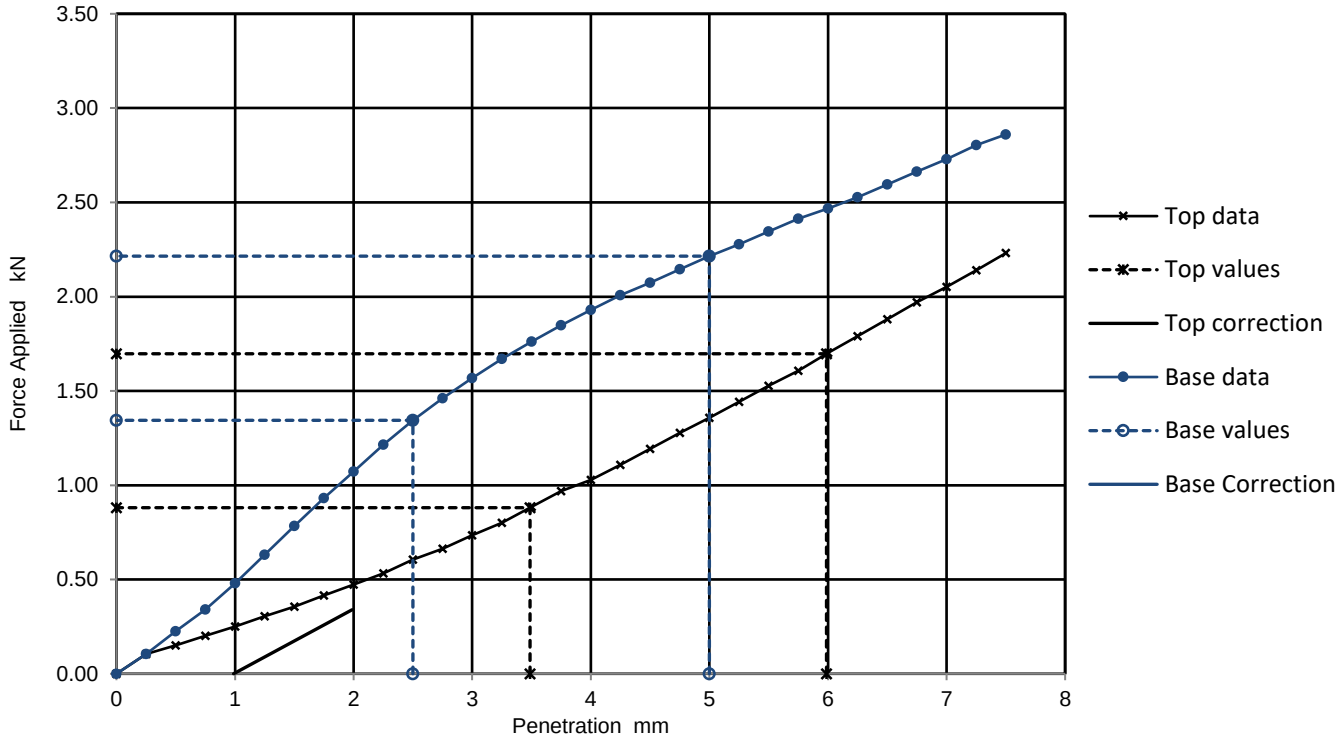
Time to surface: days

Amount of swell recorded: mm

Dry density after soaking: Mg/m3

Surcharge applied: 4.2 kg / 3 kPa

**Force v Penetration Plots**




RESULTS

| | Curve correction applied | CBR Values, % 2.5mm | 5mm | Highest | Average | Moisture Content % |
|---|---|---|---|---|---|---|
| TOP | Yes | 6.7 | 8.5 | 8.5 | | 19.0 |
| BASE | No | 10.0 | 11.0 | 11.0 | | 18.5 |

| Approved |
|---|
| Daniel Smith |

Method of Preparation: BS1377 : Part 4 : 1990, clause 7. Recompacted with specified standard effort using 2.5kg rammer

Method of Test: BS1377 : Part 4 : 1990, clause 7. Determination of California Bearing Ratio (CBR)

Remarks:

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| Laboratory Test Report | 41976 / 1 |
|---|---|

**Site:** Thurnscoe **Job Number:** 41976

**Client:** Fairhurst **Page:** 9

# Determination of California Bearing Ratio ( CBR )

| Borehole / Trial Pit | Depth (m) | Sample | % Passing 20mm Sieve | Description |
|---|---|---|---|---|
| TP07 | 0.60 | **B5** | **93.70%** | Brown gravelly SAND |

**Specimen Preparation**

Condition: REMOULDED

Details: Recompacted with specified standard effort using 2.5kg rammer

Initial Specimen details

| | | |
|---|---|---|
| Bulk density | 1.75 | Mg/m3 |
| Dry density | 1.45 | Mg/m3 |
| Moisture content | 20.8 | % |

Soaking details: Not soaked

Period of soaking: days

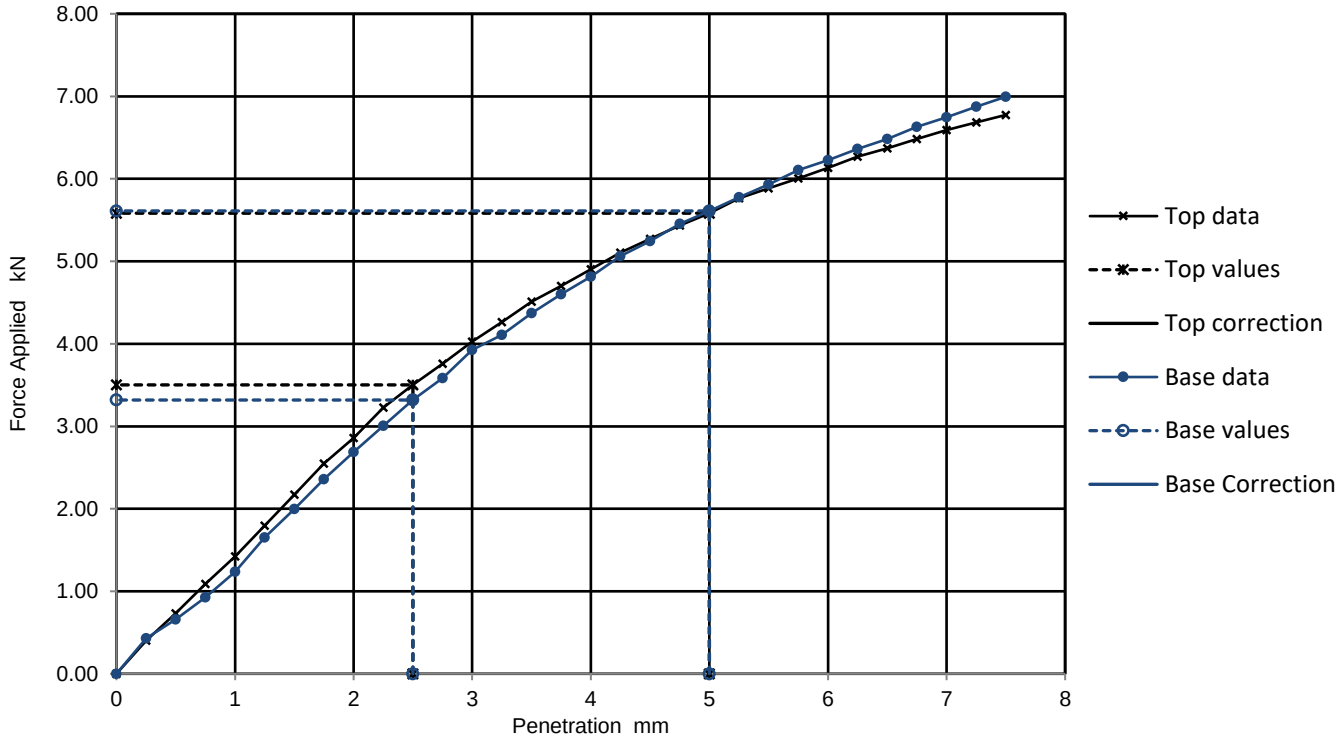
Time to surface: days

Amount of swell recorded: mm

Dry density after soaking: Mg/m3

Surcharge applied: 4.2 kg / 3 kPa

**Force v Penetration Plots**




RESULTS

| | Curve correction applied | CBR Values, % 2.5mm | 5mm | Highest | Average | Moisture Content % |
|---|---|---|---|---|---|---|
| TOP | No | 27.0 | 28.0 | 28.0 | 28.0 | 22.3 |
| BASE | No | 25.0 | 28.0 | 28.0 | | 23.6 |

| Approved |
|---|
| Daniel Smith |

Method of Preparation: BS1377 : Part 4 : 1990, clause 7. Recompacted with specified standard effort using 2.5kg rammer

Method of Test: BS1377 : Part 4 : 1990, clause 7. Determination of California Bearing Ratio (CBR)

Remarks:

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**Laboratory Test Report** 41976 / 1

**Site:** Thurnscoe **Job Number:** 41976

**Client:** Fairhurst **Page:** 10

# Determination of California Bearing Ratio ( CBR )

| Borehole / Trial Pit | Depth (m) | Sample | % Passing 20mm Sieve | Description |
|---|---|---|---|---|
| TP10 | 0.50 | **B4** | **91.10%** | Grey sandy gravelly CLAY |

**Specimen Preparation**

Condition: REMOULDED

Details: Recompacted with specified standard effort using 2.5kg rammer

Initial Specimen details

| | | |
|---|---|---|
| Bulk density | 1.78 | Mg/m3 |
| Dry density | 1.54 | Mg/m3 |
| Moisture content | 15.3 | % |

Soaking details: Not soaked

Period of soaking: days

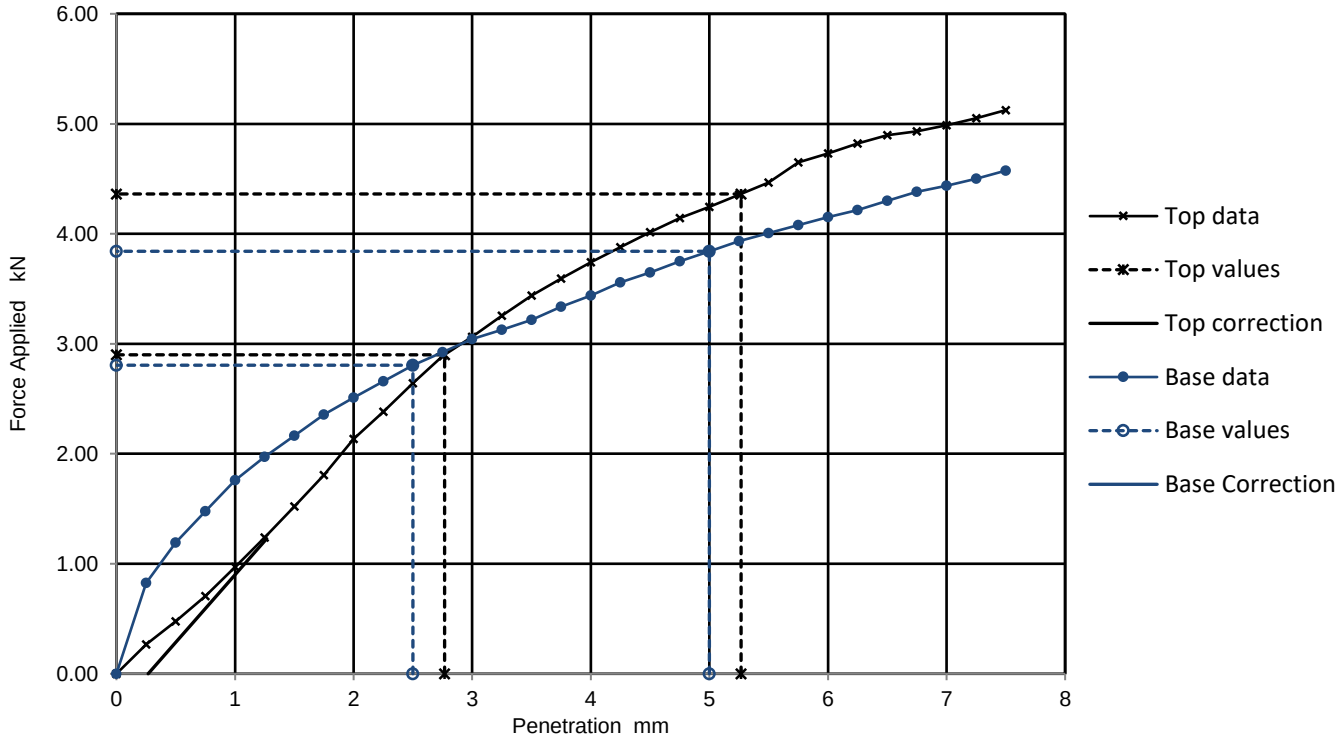
Time to surface: days

Amount of swell recorded: mm

Dry density after soaking: Mg/m3

Surcharge applied: 4.2 kg / 3 kPa

**Force v Penetration Plots**




RESULTS

| | Curve correction applied | CBR Values, % 2.5mm | 5mm | Highest | Average | Moisture Content % |
|---|---|---|---|---|---|---|
| TOP | Yes | 22.0 | 22.0 | 22.0 | 22.0 | 15.9 |
| BASE | No | 21.0 | 19.0 | 21.0 | | 16.4 |

| Approved |
|---|
| Daniel Smith |

Method of Preparation: BS1377 : Part 4 : 1990, clause 7. Recompacted with specified standard effort using 2.5kg rammer

Method of Test: BS1377 : Part 4 : 1990, clause 7. Determination of California Bearing Ratio (CBR)

Remarks:

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| IAN FARMER ASSOCIATES | Laboratory Test Report | 41976 / 1 |
|---|---|---|

**Site:** Thurnscoe **Job Number:** 41976

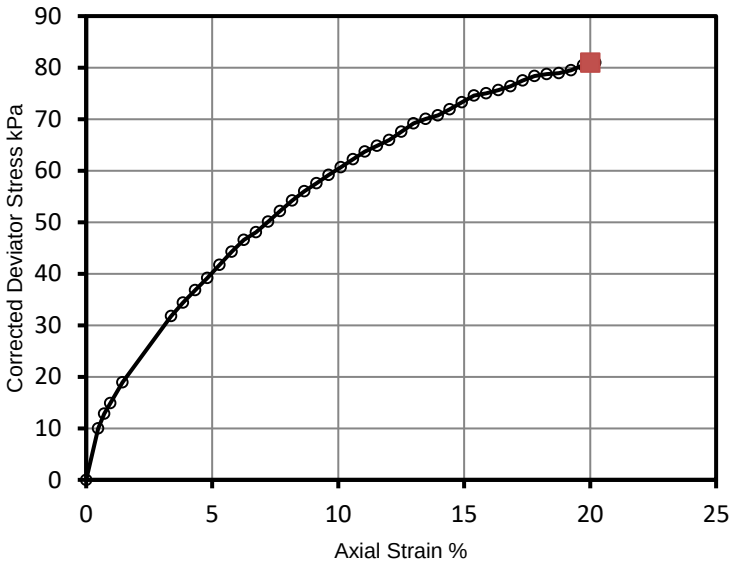
**Client:** Fairhurst **Page:** 11

# Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen (Definitive Method)

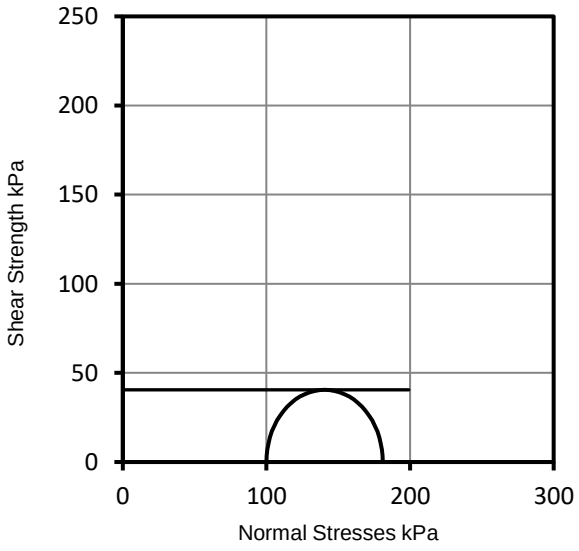
| Borehole / Trial Pit | Depth (m) | Sample | Description |
|---|---|---|---|
| BH01 | 5.00 | U16 | **Grey CLAY** |

| | | |
|---|---|---|
| Initial Sample | Test Number | 1 |
| | Original Length (mm) | 215.76 |
| | Depth from Top (mm) | 2.07 |
| | Condition | Undisturbed |
| | Orientation | Vertical |
| Length (mm) | | 207.87 |
| Diameter (mm) | | 102.34 |
| Moisture Content (%) | | 19.90 |
| Bulk Density (Mg/m3) | | 2.12 |
| Dry Density (Mg/m3) | | 1.77 |
| Membrane Thickness (mm) | | 0.29 |
| Membrane Type | | Latex |
| Rate of Strain (%/min) | | 1.9 |
| Test Results | Cell Pressure (kPa) | 100 |
| | Axial Strain (%) | 20 |
| | Membrane Corr. (kPa) | 1.1 |
| | Deviator Stress, ( σ1 - σ3 )f (kPa) | 81 |
| | Undrained Shear Strength, cu = ½( σ1 - σ3 )f (kPa) | 40 |
| | Mode of Failure | Plastic |

**Deviator Stress v Axial Strain**




**Mohr Circles**




Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377.
This is provided for information only.

**Method of Preparation:** BS 1377:PT1:1990:8.3 Preparation of undisturbed samples for testing or
BS 1377:PT1:1990:7.7.5.2 Preparation of disturbed samples for testing

**Method of Test:** BS 1377:PT2:1990:7.2 Determination of density by linear measurement.
BS 1377:PT7:1990:8.4 Determination of undrained shear strength in triaxial compression without measurement of pore pressure (Definitive method)

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| Laboratory Test Report | 41976 / 1 |
|---|---|

**Site:** Thurnscoe **Job Number:** 41976

**Client:** Thurnscoe **Page:** 12

# DETERMINATION OF MOISTURE CONDITION VALUE / MOISTURE CONTENT RELATIONSHIP

| Borehole / Trial Pit | Depth (m) | Sample | Description |
|---|---|---|---|
| TP08 | 0.4 | B5 | Brown gravelly SAND |

**Sample preparation** Amount of material larger than 20mm sieve removed 18 %

Sample Used: Single sample tested

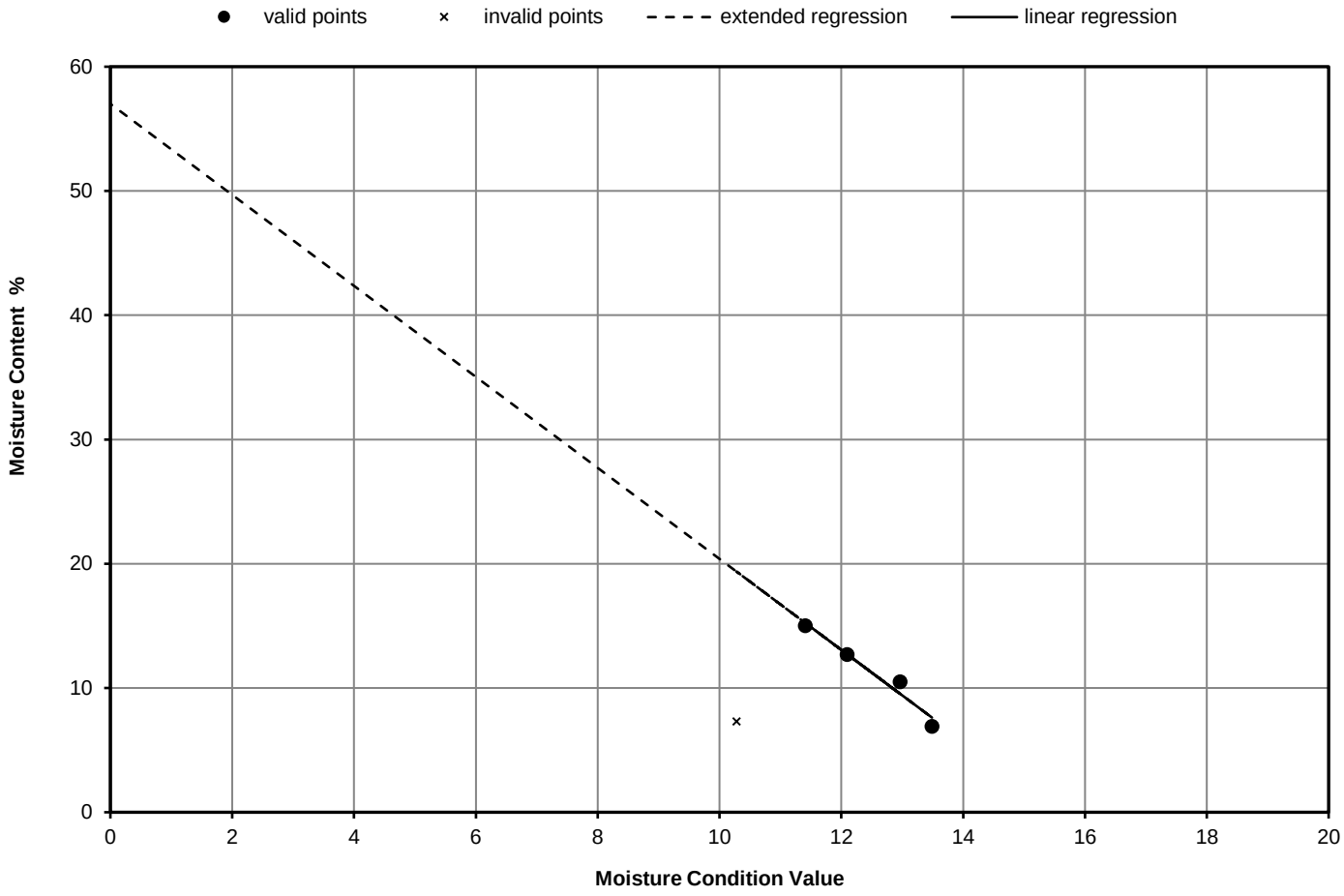



**Table of results**

| MCV Test Number | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Moisture Content, % | 15.0 | 6.9 | 7.3 | 10.5 | 12.7 |
| Moisture Condition Value | 11.4 | 13.5 | 10.3 | 13.0 | 12.1 |
| MCV report | 11.4 | 13.5 | 10.3 | 13 | 12.1 |
| Effective / Valid data point | YES | YES | NO | YES | YES |

Method of Preparation: BS 1377:Part 1:1990:7.6 Preparation of samples for compaction-related tests
BS 1377:Part 4:1990:5.5 Determination of the MCV / moisture content relation of a soil

Method of Test: BS 1377:Part 4:1990:5.5 Determination of the MCV / moisture content relation of a soil

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# Test Report - 41976 /1

| | |
|---|---|
| Site: | Thurnscoe |
| Job Number: | 41976 |
| Originating Client: | Fairhurst |

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

Date: 25/11/2016

IAN FARMER ASSOCIATES

Unit 4 Faraday Close, Pattinson North Industrial Estate, Washington, Tyne & Wear, NE38 8QJ
Tel. 0191 482 8500 Fax. 0191 482 8520 Email. washington@ianfarmer.co.uk Internet. www.ianfarmer.co.uk

F.A.O.

# Test Report - 41976C /

| | |
|---|---|
| Site: | Thurnscoe |
| Job Number: | 41976C |
| Originating Client: | Fairhurst |
| Originating Reference: | 41976 |
| Date Sampled: | Not Given |
| Date Scheduled: | 07/11/2016 |
| Date Testing Started: | 15/11/2016 |
| Date Testing Finished: | 19/11/2016 |
| Remarks: | |

Authorised By: D. Smith

Daniel Smith
Laboratory Supervisor

Date: 23/11/2016



constructionline
UK REGISTER OF PRE-QUALIFIED CONSTRUCTION SERVICES

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Warrington (01925) 855 440.

AGS ASSOCIATION OF GEOTECHNICAL & GEOENVIRONMENTAL SPECIALISTS

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**Laboratory Test Report** 41976C / 1

**Site:** Thurnscoe **Job Number:** 41976C

**Client:** Fairhurst **Page:** 2

## Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

| Borehole / Trial Pit | Depth (m) | Sample | Natural / Sieved | Natural Water Content % | Sample Passing 425 µm Sieve | | Liquid Limit % | Plastic Limit % | Plasticity Index % | Liquidity Index | Class | Description / Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Percentage % | Water Content % | | | | | | |
| BH02 | 2.00 | B7 | Sieved | 21.5 | 41 | 46.0 | 43 | 27 | 16 | 1.17 | MI | Brown sandy gravelly CLAY |
| BH04 | 0.20 | ES1 | Sieved | 18.1 | 62 | 26.0 | 36 | 26 | 10 | 0.00 | MI | Brown sandy gravelly CLAY |
| TP01 | 2.50 | D14 | Sieved | 19.8 | 67 | 27.0 | 42 | 28 | 14 | -0.06 | MI | Black / Brown sandy gravelly CLAY |

**Method of Preparation:** BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS 1377 : Part 1 : 2016 : Clause 8.4.3 Preparation of samples for plasticity tests
BS 1377 : Part 2 : 1990 : Clause 4.2 Preparation of samples for plastic limit tests

**Method of Test:** BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS 1377 : Part 2 : 1990 : Clause 4.3 or 4.4 Determination of the liquid limit
BS 1377 : Part 2 : 1990 : Clause 5.3 Determination of the plastic limit and plasticity index

UKAS TESTING 1464

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# Test Report - 41976C /1

| | |
|---|---|
| Site: | Thurnscoe |
| Job Number: | 41976C |
| Originating Client: | Fairhurst |

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

Date: 23/11/2016

# APPENDIX 4

# CHEMICAL LABORATORY TEST RESULTS

Derwentside Environmental Testing Services

# Certificate of Analysis

## Certificate Number 16-82190

02-Nov-16

| | |
|---|---|
| *Client* | Ian Farmer Associates<br>14-15 Rufford Court<br>Hardwick Grange<br>Woolston<br>Warrington<br>Cheshire<br>WA1 4RF |
| *Our Reference* | 16-82190 |
| *Client Reference* | 41976 |
| *Order No* | 41622 |
| *Contract Title* | Thurnscoe |
| *Description* | 15 Soil samples. |
| *Date Received* | 26-Oct-16 |
| *Date Started* | 26-Oct-16 |
| *Date Completed* | 02-Nov-16 |
| *Test Procedures* | Identified by prefix DETSn (details on request). |
| *Notes* | Opinions and interpretations are outside the scope of UKAS accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. Observations and interpretations are outside the scope of ISO 17025. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory. |

*Approved By*



Rob Brown
Business Manager

UKAS TESTING
2139

# Summary of Chemical Analysis
# Soil Samples

*Our Ref* 16-82190
*Client Ref* 41976
*Contract Title* Thurnscoe

| | | | | Lab No | 1073799 | 1073800 | 1073801 | 1073802 | 1073803 | 1073804 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Sample ID | TP01 | TP01 | TP02 | TP03 | TP04 | TP05 |
| | | | | Depth | 0.50 | 1.10 | 1.00 | 1.00 | 1.00 | 4.00 |
| | | | | Other ID | | | | | | |
| | | | | Sample Type | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Sampling Date | 17/10/16 | 17/10/16 | 17/10/16 | 17/10/16 | 17/10/16 | 18/10/16 |
| | | | | Sampling Time | n/s | n/s | n/s | n/s | n/s | n/s |
| **Test** | **Method** | **LOD** | **Units** | | | | | | | |
| **Metals** | | | | | | | | | | |
| Arsenic | DETSC 2301# | 0.2 | mg/kg | 14 | | 26 | 46 | | |
| Boron, Water Soluble | DETSC 2123# | 0.2 | mg/kg | 0.9 | | 1.2 | 2.1 | | |
| Cadmium | DETSC 2301# | 0.1 | mg/kg | 0.2 | | 0.1 | 0.2 | | |
| Chromium | DETSC 2301# | 0.15 | mg/kg | 16 | | 12 | 18 | | |
| Chromium III | DETSC 2301* | 0.15 | mg/kg | 16 | | 12 | 18 | | |
| Chromium, Hexavalent | DETSC 2204* | 1 | mg/kg | < 1.0 | | < 1.0 | < 1.0 | | |
| Copper | DETSC 2301# | 0.2 | mg/kg | 27 | | 57 | 64 | | |
| Lead | DETSC 2301# | 0.3 | mg/kg | 27 | | 19 | 35 | | |
| Magnesium Aqueous Extract | DETSC 2076* | 10 | mg/l | | 50 | | | | 40 |
| Mercury | DETSC 2325# | 0.05 | mg/kg | 0.07 | | 0.06 | 0.09 | | |
| Nickel | DETSC 2301# | 1 | mg/kg | 14 | | 23 | 25 | | |
| Selenium | DETSC 2301# | 0.5 | mg/kg | < 0.5 | | < 0.5 | 0.9 | | |
| Zinc | DETSC 2301# | 1 | mg/kg | 54 | | 42 | 99 | | |
| **Inorganics** | | | | | | | | | | |
| Loss on Ignition at 440oC | DETSC 2003# | 0.01 | % | | | | | | |
| pH | DETSC 2008# | | | 9.7 | 8.2 | 8.0 | 7.4 | | 6.8 |
| Calorific Value | DETSC 5008 | 1 | MJ/kg | | 6.2 | | | 5.7 | |
| Cyanide, Total | DETSC 2130# | 0.1 | mg/kg | < 0.1 | | < 0.1 | < 0.1 | | |
| Cyanide, Free | DETSC 2130# | 0.1 | mg/kg | < 0.1 | | < 0.1 | < 0.1 | | |
| Cyanide, Complex | DETSC 2130* | 0.2 | mg/kg | < 0.2 | | < 0.2 | < 0.2 | | |
| Thiocyanate | DETSC 2130# | 0.6 | mg/kg | 0.7 | | < 0.6 | < 0.6 | | |
| Total Organic Carbon | DETSC 2002 | 0.1 | % | 1.8 | | 6.1 | 5.1 | | |
| Ammonia Aqueous Extract as N | DETSC 2119 | 10 | mg/l | | < 10 | | | | < 10 |
| Chloride Aqueous Extract | DETSC 2055 | 1 | mg/l | | 13 | | | | 19 |
| Nitrate Aqueous Extract as NO3 | DETSC 2055 | 1 | mg/l | | 13 | | | | 2.1 |
| Sulphate Aqueous Extract as SO4 | DETSC 2076# | 10 | mg/l | 370 | 1100 | 770 | 1600 | | 930 |
| Sulphide | DETSC 2024# | 10 | mg/kg | 16 | 52 | 44 | 44 | | 32 |
| Sulphur (free) | DETSC 3049# | 0.75 | mg/kg | 3.9 | | 1.9 | 14 | | |
| Sulphur as S, Total | DETSC 2320 | 0.01 | % | | 0.29 | | | | 0.53 |
| Sulphate as SO4, Total | DETSC 2321# | 0.01 | % | 0.27 | 0.49 | 0.36 | 0.73 | | 0.71 |

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

# Summary of Chemical Analysis
# Soil Samples

*Our Ref* 16-82190
*Client Ref* 41976
*Contract Title* Thurnscoe

| | Lab No | 1073799 | 1073800 | 1073801 | 1073802 | 1073803 | 1073804 |
|---|---|---|---|---|---|---|---|
| | Sample ID | TP01 | TP01 | TP02 | TP03 | TP04 | TP05 |
| | Depth | 0.50 | 1.10 | 1.00 | 1.00 | 1.00 | 4.00 |
| | Other ID | | | | | | |
| | Sample Type | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | Sampling Date | 17/10/16 | 17/10/16 | 17/10/16 | 17/10/16 | 17/10/16 | 18/10/16 |
| | Sampling Time | n/s | n/s | n/s | n/s | n/s | n/s |
| **Test** | **Method** | **LOD** | **Units** | | | | |
| **Petroleum Hydrocarbons** | | | | | | | |
| Aliphatic C5-C6 | DETSC 3321* | 0.01 | mg/kg | 0.03 | | 0.03 | 0.02 | | |
| Aliphatic C6-C8 | DETSC 3321* | 0.01 | mg/kg | 0.02 | | 0.02 | < 0.01 | | |
| Aliphatic C8-C10 | DETSC 3321* | 0.01 | mg/kg | < 0.01 | | < 0.01 | < 0.01 | | |
| Aliphatic C10-C12 | DETSC 3072# | 1.5 | mg/kg | < 1.5 | | < 1.5 | < 1.5 | | |
| Aliphatic C12-C16 | DETSC 3072# | 1.2 | mg/kg | < 1.2 | | < 1.2 | < 1.2 | | |
| Aliphatic C16-C21 | DETSC 3072# | 1.5 | mg/kg | < 1.5 | | < 1.5 | < 1.5 | | |
| Aliphatic C21-C35 | DETSC 3072# | 3.4 | mg/kg | < 3.4 | | < 3.4 | < 3.4 | | |
| Aliphatic C5-C35 | DETSC 3072* | 10 | mg/kg | < 10 | | < 10 | < 10 | | |
| Aromatic C5-C7 | DETSC 3321* | 0.01 | mg/kg | < 0.01 | | < 0.01 | < 0.01 | | |
| Aromatic C7-C8 | DETSC 3321* | 0.01 | mg/kg | < 0.01 | | < 0.01 | < 0.01 | | |
| Aromatic C8-C10 | DETSC 3321* | 0.01 | mg/kg | < 0.01 | | < 0.01 | < 0.01 | | |
| Aromatic C10-C12 | DETSC 3072# | 0.9 | mg/kg | 16 | | 15 | < 0.9 | | |
| Aromatic C12-C16 | DETSC 3072# | 0.5 | mg/kg | 5.8 | | 5.4 | < 0.5 | | |
| Aromatic C16-C21 | DETSC 3072# | 0.6 | mg/kg | 8.0 | | 6.1 | < 0.6 | | |
| Aromatic C21-C35 | DETSC 3072# | 1.4 | mg/kg | 18 | | 15 | < 1.4 | | |
| Aromatic C5-C35 | DETSC 3072* | 10 | mg/kg | 47 | | 42 | < 10 | | |
| TPH Ali/Aro Total | DETSC 3072* | 10 | mg/kg | 47 | | 42 | < 10 | | |
| EPH (C10-C40) | DETSC 3311# | 10 | mg/kg | 120 | | 67 | 96 | | |
| **PAHs** | | | | | | | |
| Acenaphthene | DETSC 3301 | 0.1 | mg/kg | 0.2 | | 0.3 | 0.5 | | |
| Acenaphthylene | DETSC 3301 | 0.1 | mg/kg | < 0.1 | | 0.1 | 0.2 | | |
| Anthracene | DETSC 3301 | 0.1 | mg/kg | 0.1 | | 0.1 | 0.2 | | |
| Benzo(a)anthracene | DETSC 3301 | 0.1 | mg/kg | < 0.1 | | < 0.1 | 0.5 | | |
| Benzo(a)pyrene | DETSC 3301 | 0.1 | mg/kg | < 0.1 | | < 0.1 | 0.4 | | |
| Benzo(b)fluoranthene | DETSC 3301 | 0.1 | mg/kg | < 0.1 | | < 0.1 | 0.3 | | |
| Benzo(g,h,i)perylene | DETSC 3301 | 0.1 | mg/kg | < 0.1 | | < 0.1 | < 0.1 | | |
| Benzo(k)fluoranthene | DETSC 3301 | 0.1 | mg/kg | < 0.1 | | < 0.1 | 0.2 | | |
| Chrysene | DETSC 3301 | 0.1 | mg/kg | < 0.1 | | < 0.1 | 0.4 | | |
| Dibenzo(a,h)anthracene | DETSC 3301 | 0.1 | mg/kg | < 0.1 | | < 0.1 | < 0.1 | | |
| Fluoranthene | DETSC 3301 | 0.1 | mg/kg | 0.4 | | 0.2 | 1.0 | | |
| Fluorene | DETSC 3301 | 0.1 | mg/kg | < 0.1 | | < 0.1 | 0.3 | | |
| Indeno(1,2,3-c,d)pyrene | DETSC 3301 | 0.1 | mg/kg | < 0.1 | | < 0.1 | < 0.1 | | |
| Naphthalene | DETSC 3301 | 0.1 | mg/kg | 0.6 | | 1.0 | 1.0 | | |
| Phenanthrene | DETSC 3301 | 0.1 | mg/kg | 0.5 | | 0.4 | 1.0 | | |
| Pyrene | DETSC 3301 | 0.1 | mg/kg | 0.6 | | 0.4 | 1.0 | | |
| PAH Total | DETSC 3301 | 1.6 | mg/kg | 2.6 | | 2.6 | 7.0 | | |
| **Phenols** | | | | | | | |
| Phenol - Monohydric | DETSC 2130# | 0.3 | mg/kg | < 0.3 | | 0.4 | 0.5 | | |

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

# Summary of Chemical Analysis
# Soil Samples

*Our Ref* 16-82190
*Client Ref* 41976
*Contract Title* Thurnscoe

| | Lab No | 1073805 | 1073806 | 1073807 | 1073808 | 1073809 | 1073810 |
|---|---|---|---|---|---|---|---|
| | Sample ID | TP05 | TP06 | TP06 | TP07 | TP07 | TP08 |
| | Depth | 1.00 | 1.00 | 2.00 | 1.00 | 2.20 | 0.80 |
| | Other ID | | | | | | |
| | Sample Type | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | Sampling Date | 18/10/16 | 18/10/16 | 18/10/16 | 18/10/16 | 18/10/16 | 18/10/16 |
| | Sampling Time | n/s | n/s | n/s | n/s | n/s | n/s |
| **Test** | **Method** | **LOD** | **Units** | | | | |
| **Metals** | | | | | | | |
| Arsenic | DETSC 2301# | 0.2 | mg/kg | | 40 | | 72 | | 41 |
| Boron, Water Soluble | DETSC 2123# | 0.2 | mg/kg | | 1.8 | | 0.9 | | 0.3 |
| Cadmium | DETSC 2301# | 0.1 | mg/kg | | 0.1 | | 0.1 | | < 0.1 |
| Chromium | DETSC 2301# | 0.15 | mg/kg | | 14 | | 13 | | 18 |
| Chromium III | DETSC 2301* | 0.15 | mg/kg | | 14 | | 13 | | 18 |
| Chromium, Hexavalent | DETSC 2204* | 1 | mg/kg | | < 1.0 | | < 1.0 | | < 1.0 |
| Copper | DETSC 2301# | 0.2 | mg/kg | | 55 | | 39 | | 26 |
| Lead | DETSC 2301# | 0.3 | mg/kg | | 22 | | 23 | | 14 |
| Magnesium Aqueous Extract | DETSC 2076* | 10 | mg/l | 58 | | | | 140 | |
| Mercury | DETSC 2325# | 0.05 | mg/kg | | 0.23 | | 0.13 | | < 0.05 |
| Nickel | DETSC 2301# | 1 | mg/kg | | 21 | | 22 | | 22 |
| Selenium | DETSC 2301# | 0.5 | mg/kg | | 0.8 | | < 0.5 | | < 0.5 |
| Zinc | DETSC 2301# | 1 | mg/kg | | 53 | | 43 | | 56 |
| **Inorganics** | | | | | | | | | |
| Loss on Ignition at 440oC | DETSC 2003# | 0.01 | % | | 31 | | | | |
| pH | DETSC 2008# | | | 6.2 | 7.2 | | 7.5 | 6.7 | 7.5 |
| Calorific Value | DETSC 5008 | 1 | MJ/kg | | | 5.7 | | | |
| Cyanide, Total | DETSC 2130# | 0.1 | mg/kg | | < 0.1 | | < 0.1 | | < 0.1 |
| Cyanide, Free | DETSC 2130# | 0.1 | mg/kg | | < 0.1 | | < 0.1 | | < 0.1 |
| Cyanide, Complex | DETSC 2130* | 0.2 | mg/kg | | < 0.2 | | < 0.2 | | < 0.2 |
| Thiocyanate | DETSC 2130# | 0.6 | mg/kg | | < 0.6 | | 1.6 | | < 0.6 |
| Total Organic Carbon | DETSC 2002 | 0.1 | % | | > 15 | | 0.5 | | 0.9 |
| Ammonia Aqueous Extract as N | DETSC 2119 | 10 | mg/l | < 10 | | | | < 10 | |
| Chloride Aqueous Extract | DETSC 2055 | 1 | mg/l | 9.0 | | | | 79 | |
| Nitrate Aqueous Extract as NO3 | DETSC 2055 | 1 | mg/l | < 1.0 | | | | < 1.0 | |
| Sulphate Aqueous Extract as SO4 | DETSC 2076# | 10 | mg/l | 770 | 1600 | | 1600 | 2000 | 980 |
| Sulphide | DETSC 2024# | 10 | mg/kg | 32 | 20 | | 26 | < 10 | 57 |
| Sulphur (free) | DETSC 3049# | 0.75 | mg/kg | | 21 | | 6.9 | | < 0.75 |
| Sulphur as S, Total | DETSC 2320 | 0.01 | % | 1.9 | | | | 2.1 | |
| Sulphate as SO4, Total | DETSC 2321# | 0.01 | % | 0.46 | 1.1 | | 2.1 | 5.5 | 1.2 |

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

# Summary of Chemical Analysis
# Soil Samples

*Our Ref* 16-82190
*Client Ref* 41976
*Contract Title* Thurnscoe

| | | | | Lab No | 1073805 | 1073806 | 1073807 | 1073808 | 1073809 | 1073810 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Sample ID | TP05 | TP06 | TP06 | TP07 | TP07 | TP08 |
| | | | | Depth | 1.00 | 1.00 | 2.00 | 1.00 | 2.20 | 0.80 |
| | | | | Other ID | | | | | | |
| | | | | Sample Type | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Sampling Date | 18/10/16 | 18/10/16 | 18/10/16 | 18/10/16 | 18/10/16 | 18/10/16 |
| | | | | Sampling Time | n/s | n/s | n/s | n/s | n/s | n/s |
| **Test** | **Method** | **LOD** | **Units** | | | | | | | |
| **Petroleum Hydrocarbons** | | | | | | | | | | |
| Aliphatic C5-C6 | DETSC 3321* | 0.01 | mg/kg | | < 0.01 | | < 0.01 | | 0.02 |
| Aliphatic C6-C8 | DETSC 3321* | 0.01 | mg/kg | | < 0.01 | | < 0.01 | | < 0.01 |
| Aliphatic C8-C10 | DETSC 3321* | 0.01 | mg/kg | | < 0.01 | | < 0.01 | | < 0.01 |
| Aliphatic C10-C12 | DETSC 3072# | 1.5 | mg/kg | | < 1.5 | | < 1.5 | | < 1.5 |
| Aliphatic C12-C16 | DETSC 3072# | 1.2 | mg/kg | | < 1.2 | | < 1.2 | | < 1.2 |
| Aliphatic C16-C21 | DETSC 3072# | 1.5 | mg/kg | | 2.3 | | < 1.5 | | < 1.5 |
| Aliphatic C21-C35 | DETSC 3072# | 3.4 | mg/kg | | 13 | | < 3.4 | | < 3.4 |
| Aliphatic C5-C35 | DETSC 3072* | 10 | mg/kg | | 15 | | < 10 | | < 10 |
| Aromatic C5-C7 | DETSC 3321* | 0.01 | mg/kg | | < 0.01 | | < 0.01 | | < 0.01 |
| Aromatic C7-C8 | DETSC 3321* | 0.01 | mg/kg | | < 0.01 | | < 0.01 | | < 0.01 |
| Aromatic C8-C10 | DETSC 3321* | 0.01 | mg/kg | | < 0.01 | | < 0.01 | | < 0.01 |
| Aromatic C10-C12 | DETSC 3072# | 0.9 | mg/kg | | 13 | | < 0.9 | | < 0.9 |
| Aromatic C12-C16 | DETSC 3072# | 0.5 | mg/kg | | 3.8 | | < 0.5 | | < 0.5 |
| Aromatic C16-C21 | DETSC 3072# | 0.6 | mg/kg | | 5.9 | | < 0.6 | | < 0.6 |
| Aromatic C21-C35 | DETSC 3072# | 1.4 | mg/kg | | 15 | | < 1.4 | | < 1.4 |
| Aromatic C5-C35 | DETSC 3072* | 10 | mg/kg | | 38 | | < 10 | | < 10 |
| TPH Ali/Aro Total | DETSC 3072* | 10 | mg/kg | | 53 | | < 10 | | < 10 |
| EPH (C10-C40) | DETSC 3311# | 10 | mg/kg | | 230 | | 70 | | 12 |
| **PAHs** | | | | | | | | | | |
| Acenaphthene | DETSC 3301 | 0.1 | mg/kg | | 1.0 | | 0.4 | | < 0.1 |
| Acenaphthylene | DETSC 3301 | 0.1 | mg/kg | | < 0.1 | | 0.2 | | < 0.1 |
| Anthracene | DETSC 3301 | 0.1 | mg/kg | | 0.3 | | < 0.1 | | < 0.1 |
| Benzo(a)anthracene | DETSC 3301 | 0.1 | mg/kg | | 0.3 | | < 0.1 | | < 0.1 |
| Benzo(a)pyrene | DETSC 3301 | 0.1 | mg/kg | | < 0.1 | | < 0.1 | | < 0.1 |
| Benzo(b)fluoranthene | DETSC 3301 | 0.1 | mg/kg | | < 0.1 | | < 0.1 | | < 0.1 |
| Benzo(g,h,i)perylene | DETSC 3301 | 0.1 | mg/kg | | < 0.1 | | < 0.1 | | < 0.1 |
| Benzo(k)fluoranthene | DETSC 3301 | 0.1 | mg/kg | | < 0.1 | | < 0.1 | | < 0.1 |
| Chrysene | DETSC 3301 | 0.1 | mg/kg | | 0.3 | | < 0.1 | | < 0.1 |
| Dibenzo(a,h)anthracene | DETSC 3301 | 0.1 | mg/kg | | < 0.1 | | < 0.1 | | < 0.1 |
| Fluoranthene | DETSC 3301 | 0.1 | mg/kg | | 0.3 | | < 0.1 | | < 0.1 |
| Fluorene | DETSC 3301 | 0.1 | mg/kg | | < 0.1 | | 0.1 | | < 0.1 |
| Indeno(1,2,3-c,d)pyrene | DETSC 3301 | 0.1 | mg/kg | | < 0.1 | | < 0.1 | | < 0.1 |
| Naphthalene | DETSC 3301 | 0.1 | mg/kg | | 1.3 | | 0.9 | | < 0.1 |
| Phenanthrene | DETSC 3301 | 0.1 | mg/kg | | 1.4 | | 0.8 | | < 0.1 |
| Pyrene | DETSC 3301 | 0.1 | mg/kg | | 0.4 | | < 0.1 | | < 0.1 |
| PAH Total | DETSC 3301 | 1.6 | mg/kg | | 5.3 | | 2.5 | | < 1.6 |
| **Phenols** | | | | | | | | | | |
| Phenol - Monohydric | DETSC 2130# | 0.3 | mg/kg | | 1.1 | | < 0.3 | | < 0.3 |

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

# Summary of Chemical Analysis
# Soil Samples

*Our Ref* 16-82190
*Client Ref* 41976
*Contract Title* Thurnscoe

| | Lab No | 1073811 | 1075908 | 1075909 |
|---|---|---|---|---|
| | Sample ID | TP10 | BH01 | BH02 |
| | Depth | 1.10 | 5.50 | 5.70 |
| | Other ID | | | |
| | Sample Type | SOIL | SOIL | SOIL |
| | Sampling Date | 17/10/16 | n/s | n/s |
| | Sampling Time | n/s | n/s | n/s |

| Test | Method | LOD | Units | | | |
|---|---|---|---|---|---|---|
| **Metals** | | | | | | |
| Arsenic | DETSC 2301# | 0.2 | mg/kg | 37 | | |
| Boron, Water Soluble | DETSC 2123# | 0.2 | mg/kg | 2.1 | | |
| Cadmium | DETSC 2301# | 0.1 | mg/kg | 0.4 | | |
| Chromium | DETSC 2301# | 0.15 | mg/kg | 15 | | |
| Chromium III | DETSC 2301* | 0.15 | mg/kg | 15 | | |
| Chromium, Hexavalent | DETSC 2204* | 1 | mg/kg | < 1.0 | | |
| Copper | DETSC 2301# | 0.2 | mg/kg | 55 | | |
| Lead | DETSC 2301# | 0.3 | mg/kg | 100 | | |
| Magnesium Aqueous Extract | DETSC 2076* | 10 | mg/l | | 89 | 150 |
| Mercury | DETSC 2325# | 0.05 | mg/kg | 0.09 | | |
| Nickel | DETSC 2301# | 1 | mg/kg | 22 | | |
| Selenium | DETSC 2301# | 0.5 | mg/kg | < 0.5 | | |
| Zinc | DETSC 2301# | 1 | mg/kg | 68 | | |
| **Inorganics** | | | | | | |
| Loss on Ignition at 440oC | DETSC 2003# | 0.01 | % | | | |
| pH | DETSC 2008# | | | 7.3 | 6.7 | 6.6 |
| Calorific Value | DETSC 5008 | 1 | MJ/kg | 5.0 | | |
| Cyanide, Total | DETSC 2130# | 0.1 | mg/kg | < 0.1 | | |
| Cyanide, Free | DETSC 2130# | 0.1 | mg/kg | < 0.1 | | |
| Cyanide, Complex | DETSC 2130* | 0.2 | mg/kg | < 0.2 | | |
| Thiocyanate | DETSC 2130# | 0.6 | mg/kg | < 0.6 | | |
| Total Organic Carbon | DETSC 2002 | 0.1 | % | 3.0 | | |
| Ammonia Aqueous Extract as N | DETSC 2119 | 10 | mg/l | | < 10 | < 10 |
| Chloride Aqueous Extract | DETSC 2055 | 1 | mg/l | | 27 | 52 |
| Nitrate Aqueous Extract as NO3 | DETSC 2055 | 1 | mg/l | | < 1.0 | < 1.0 |
| Sulphate Aqueous Extract as SO4 | DETSC 2076# | 10 | mg/l | 1600 | 1800 | 2100 |
| Sulphide | DETSC 2024# | 10 | mg/kg | 28 | 32 | 48 |
| Sulphur (free) | DETSC 3049# | 0.75 | mg/kg | 7.8 | | |
| Sulphur as S, Total | DETSC 2320 | 0.01 | % | | 1.3 | 1.5 |
| Sulphate as SO4, Total | DETSC 2321# | 0.01 | % | 0.72 | 3.8 | 4.0 |

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

# Summary of Chemical Analysis
# Soil Samples

*Our Ref* 16-82190
*Client Ref* 41976
*Contract Title* Thurnscoe

| | | | | Lab No | 1073811 | 1075908 | 1075909 |
|---|---|---|---|---|---|---|---|
| | | | | Sample ID | TP10 | BH01 | BH02 |
| | | | | Depth | 1.10 | 5.50 | 5.70 |
| | | | | Other ID | | | |
| | | | | Sample Type | SOIL | SOIL | SOIL |
| | | | | Sampling Date | 17/10/16 | n/s | n/s |
| | | | | Sampling Time | n/s | n/s | n/s |
| **Test** | **Method** | **LOD** | **Units** | | | | |
| **Petroleum Hydrocarbons** | | | | | | | |
| Aliphatic C5-C6 | DETSC 3321* | 0.01 | mg/kg | 0.04 | | |
| Aliphatic C6-C8 | DETSC 3321* | 0.01 | mg/kg | < 0.01 | | |
| Aliphatic C8-C10 | DETSC 3321* | 0.01 | mg/kg | < 0.01 | | |
| Aliphatic C10-C12 | DETSC 3072# | 1.5 | mg/kg | < 1.5 | | |
| Aliphatic C12-C16 | DETSC 3072# | 1.2 | mg/kg | < 1.2 | | |
| Aliphatic C16-C21 | DETSC 3072# | 1.5 | mg/kg | < 1.5 | | |
| Aliphatic C21-C35 | DETSC 3072# | 3.4 | mg/kg | < 3.4 | | |
| Aliphatic C5-C35 | DETSC 3072* | 10 | mg/kg | < 10 | | |
| Aromatic C5-C7 | DETSC 3321* | 0.01 | mg/kg | < 0.01 | | |
| Aromatic C7-C8 | DETSC 3321* | 0.01 | mg/kg | < 0.01 | | |
| Aromatic C8-C10 | DETSC 3321* | 0.01 | mg/kg | < 0.01 | | |
| Aromatic C10-C12 | DETSC 3072# | 0.9 | mg/kg | < 0.9 | | |
| Aromatic C12-C16 | DETSC 3072# | 0.5 | mg/kg | < 0.5 | | |
| Aromatic C16-C21 | DETSC 3072# | 0.6 | mg/kg | < 0.6 | | |
| Aromatic C21-C35 | DETSC 3072# | 1.4 | mg/kg | < 1.4 | | |
| Aromatic C5-C35 | DETSC 3072* | 10 | mg/kg | < 10 | | |
| TPH Ali/Aro Total | DETSC 3072* | 10 | mg/kg | < 10 | | |
| EPH (C10-C40) | DETSC 3311# | 10 | mg/kg | 150 | | |
| **PAHs** | | | | | | |
| Acenaphthene | DETSC 3301 | 0.1 | mg/kg | 0.8 | | |
| Acenaphthylene | DETSC 3301 | 0.1 | mg/kg | 0.2 | | |
| Anthracene | DETSC 3301 | 0.1 | mg/kg | 0.4 | | |
| Benzo(a)anthracene | DETSC 3301 | 0.1 | mg/kg | 1.4 | | |
| Benzo(a)pyrene | DETSC 3301 | 0.1 | mg/kg | 1.4 | | |
| Benzo(b)fluoranthene | DETSC 3301 | 0.1 | mg/kg | 1.1 | | |
| Benzo(g,h,i)perylene | DETSC 3301 | 0.1 | mg/kg | 0.9 | | |
| Benzo(k)fluoranthene | DETSC 3301 | 0.1 | mg/kg | 0.6 | | |
| Chrysene | DETSC 3301 | 0.1 | mg/kg | 1.3 | | |
| Dibenzo(a,h)anthracene | DETSC 3301 | 0.1 | mg/kg | 0.2 | | |
| Fluoranthene | DETSC 3301 | 0.1 | mg/kg | 2.9 | | |
| Fluorene | DETSC 3301 | 0.1 | mg/kg | 0.4 | | |
| Indeno(1,2,3-c,d)pyrene | DETSC 3301 | 0.1 | mg/kg | 1.0 | | |
| Naphthalene | DETSC 3301 | 0.1 | mg/kg | 1.6 | | |
| Phenanthrene | DETSC 3301 | 0.1 | mg/kg | 1.8 | | |
| Pyrene | DETSC 3301 | 0.1 | mg/kg | 3.0 | | |
| PAH Total | DETSC 3301 | 1.6 | mg/kg | 19 | | |
| **Phenols** | | | | | | |
| Phenol - Monohydric | DETSC 2130# | 0.3 | mg/kg | 0.4 | | |

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

# Summary of Asbestos Analysis
# Soil Samples

*Our Ref* 16-82190
*Client Ref* 41976
*Contract Title* Thurnscoe

| Lab No | Sample ID | Material Type | Result | Comment* | Analyst |
|---|---|---|---|---|---|
| 1073799 | TP01 0.50 | SOIL | NAD | none | Michael Kay |
| 1073801 | TP02 1.00 | SOIL | NAD | none | Michael Kay |
| 1073802 | TP03 1.00 | SOIL | Chrysotile | Small bundle of Chrysotile | Michael Kay |
| 1073806 | TP06 1.00 | SOIL | NAD | none | Michael Kay |
| 1073808 | TP07 1.00 | SOIL | NAD | none | Michael Kay |

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * -not included in laboratory scope of accreditation.

# Information in Support of the Analytical Results

*Our Ref* 16-82190
*Client Ref* 41976
*Contract* Thurnscoe

## Containers Received & Deviating Samples

| Lab No | Sample ID | Date Sampled | Containers Received | Holding time exceeded for tests | Inappropriate container for tests |
|---|---|---|---|---|---|
| 1073799 | TP01 0.50 SOIL | 17/10/16 | GJ 250ml, GV, PT 1L | pH + Conductivity (7 days) | |
| 1073800 | TP01 1.10 SOIL | 17/10/16 | GJ 250ml, GV, PT 1L | pH + Conductivity (7 days) | |
| 1073801 | TP02 1.00 SOIL | 17/10/16 | GJ 250ml, GV, PT 1L | pH + Conductivity (7 days) | |
| 1073802 | TP03 1.00 SOIL | 17/10/16 | GJ 250ml, GV, PT 1L | pH + Conductivity (7 days) | |
| 1073803 | TP04 1.00 SOIL | 17/10/16 | GJ 250ml, GV, PT 1L | | |
| 1073804 | TP05 4.00 SOIL | 18/10/16 | GJ 250ml, GV, PT 1L | pH + Conductivity (7 days) | |
| 1073805 | TP05 1.00 SOIL | 18/10/16 | GJ 250ml, GV, PT 1L | pH + Conductivity (7 days) | |
| 1073806 | TP06 1.00 SOIL | 18/10/16 | GJ 250ml, GV, PT 1L | pH + Conductivity (7 days) | |
| 1073807 | TP06 2.00 SOIL | 18/10/16 | GJ 250ml, GV, PT 1L | | |
| 1073808 | TP07 1.00 SOIL | 18/10/16 | GJ 250ml, GV, PT 1L | pH + Conductivity (7 days) | |
| 1073809 | TP07 2.20 SOIL | 18/10/16 | GJ 250ml, GV, PT 1L | pH + Conductivity (7 days) | |
| 1073810 | TP08 0.80 SOIL | 18/10/16 | GJ 250ml, GV, PT 1L | pH + Conductivity (7 days) | |
| 1073811 | TP10 1.10 SOIL | 17/10/16 | GJ 250ml, GV, PT 1L | pH + Conductivity (7 days) | |
| 1075908 | BH01 5.50 SOIL | | PT 1L | Sample date not supplied, Anions 2:1 (365 days), Ammonia Aqueous Extract (1095 days), Total Sulphur ICP (365 days), Total Sulphate ICP (730 days), Metals ICP Prep (365 days), pH + Conductivity (7 days) | |
| 1075909 | BH02 5.70 SOIL | | PT 1L | Sample date not supplied, Anions 2:1 (365 days), Ammonia Aqueous Extract (1095 days), Total Sulphur ICP (365 days), Total Sulphate ICP (730 days), Metals ICP Prep (365 days), pH + Conductivity (7 days) | |

Key: G-Glass P-Plastic J-Jar V-Vial T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

## Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

## Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

Derwentside Environmental Testing Services

# Certificate of Analysis

## Certificate Number 16-83137

11-Nov-16

| | |
|---|---|
| *Client* | Ian Farmer Associates<br>14-15 Rufford Court<br>Hardwick Grange<br>Woolston<br>Warrington<br>Cheshire<br>WA1 4RF |
| *Our Reference* | 16-83137 |
| *Client Reference* | 41976 |
| *Order No* | 41701 |
| *Contract Title* | Thurnscoe |
| *Description* | One Water sample. |
| *Date Received* | 05-Nov-16 |
| *Date Started* | 05-Nov-16 |
| *Date Completed* | 11-Nov-16 |
| *Test Procedures* | Identified by prefix DETSn (details on request). |
| *Notes* | Opinions and interpretations are outside the scope of UKAS accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. Observations and interpretations are outside the scope of ISO 17025. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory. |

*Approved By*



Rob Brown
Business Manager

UKAS TESTING
2139

# Summary of Chemical Analysis
# Water Samples

*Our Ref* 16-83137
*Client Ref* 41976
*Contract Title* Thurnscoe

| | | | | |
|---|---|---|---|---|
| | | | **Lab No** | 1079383 |
| | | | **Sample ID** | P2 |
| | | | **Depth** | 8.31 |
| | | | **Other ID** | |
| | | | **Sample Type** | WATER |
| | | | **Sampling Date** | 04/11/16 |
| | | | **Sampling Time** | n/s |
| **Test** | **Method** | **LOD** | **Units** | |
| **Metals** | | | | |
| Arsenic, Dissolved | DETSC 2306 | 0.16 | ug/l | 4.7 |
| Boron | DETSC 2123 | 100 | ug/l | 1000 |
| Cadmium, Dissolved | DETSC 2306 | 0.03 | ug/l | 0.06 |
| Chromium, Dissolved | DETSC 2306 | 0.25 | ug/l | 0.27 |
| Copper, Dissolved | DETSC 2306 | 0.4 | ug/l | 2.2 |
| Lead, Dissolved | DETSC 2306 | 0.09 | ug/l | 0.31 |
| Mercury, Dissolved | DETSC 2306 | 0.01 | ug/l | 0.02 |
| Nickel, Dissolved | DETSC 2306 | 0.5 | ug/l | 5.0 |
| Selenium, Dissolved | DETSC 2306 | 0.25 | ug/l | 3.3 |
| Zinc, Dissolved | DETSC 2306 | 1.3 | ug/l | 240 |
| **Inorganics** | | | | |
| pH | DETSC 2008 | | | 7.5 |
| Cyanide, Total | DETSC 2130 | 40 | ug/l | < 40 |
| Cyanide, Free | DETSC 2130 | 20 | ug/l | < 20 |
| Cyanide, Complex | DETSC 2130* | 40 | ug/l | < 40 |
| Thiocyanate | DETSC 2130 | 40 | ug/l | < 40 |
| Ammoniacal Nitrogen as NH4 | DETSC 2207 | 0.02 | mg/l | < 0.02 |
| Ammoniacal Nitrogen as NH3 | DETSC 2207 | 0.4 | mg/l | < 0.4 |
| Sulphate as SO4 | DETSC 2055 | 0.1 | mg/l | 1700 |
| Sulphide | DETSC 2208 | 10 | ug/l | 21 |
| Sulphur (free) | DETSC 3049 | 84 | ug/l | < 84 |
| **Petroleum Hydrocarbons** | | | | |
| EPH (C10-C40) | DETSC 3311 | 10 | ug/l | 20 |
| **PAHs** | | | | |
| Acenaphthene | DETSC 3304 | 0.01 | ug/l | < 0.01 |
| Acenaphthylene | DETSC 3304 | 0.01 | ug/l | < 0.01 |
| Anthracene | DETSC 3304 | 0.01 | ug/l | < 0.01 |
| Benzo(a)anthracene | DETSC 3304 | 0.01 | ug/l | < 0.01 |
| Benzo(a)pyrene | DETSC 3304 | 0.01 | ug/l | < 0.01 |
| Benzo(b)fluoranthene | DETSC 3304 | 0.01 | ug/l | < 0.01 |
| Benzo(g,h,i)perylene | DETSC 3304* | 0.01 | ug/l | < 0.01 |
| Benzo(k)fluoranthene | DETSC 3304 | 0.01 | ug/l | < 0.01 |
| Chrysene | DETSC 3304 | 0.01 | ug/l | < 0.01 |
| Dibenzo(a,h)anthracene | DETSC 3304 | 0.01 | ug/l | < 0.01 |
| Fluoranthene | DETSC 3304 | 0.01 | ug/l | 0.01 |
| Fluorene | DETSC 3304 | 0.01 | ug/l | < 0.01 |
| Indeno(1,2,3-c,d)pyrene | DETSC 3304* | 0.01 | ug/l | < 0.01 |
| Naphthalene | DETSC 3304 | 0.01 | ug/l | < 0.01 |
| Phenanthrene | DETSC 3304 | 0.01 | ug/l | 0.01 |
| Pyrene | DETSC 3304 | 0.01 | ug/l | 0.02 |
| PAH Total | DETSC 3304 | 0.04 | ug/l | < 0.04 |

Key: * -not accredited. n/s -not supplied.

# Summary of Chemical Analysis
# Water Samples

*Our Ref* 16-83137
*Client Ref* 41976
*Contract Title* Thurnscoe

| | |
|---|---|
| **Lab No** | 1079383 |
| **Sample ID** | P2 |
| **Depth** | 8.31 |
| **Other ID** | |
| **Sample Type** | WATER |
| **Sampling Date** | 04/11/16 |
| **Sampling Time** | n/s |

| Test | Method | LOD | Units | |
|---|---|---|---|---|
| **Phenols** | | | | |
| Phenol | * | 0.5 | ug/l | < 0.50 |

Key: * -not accredited. n/s -not supplied.

# Information in Support of the Analytical Results

*Our Ref* 16-83137
*Client Ref* 41976
*Contract* Thurnscoe

## Containers Received & Deviating Samples

| Lab No | Sample ID | Date Sampled | Containers Received | Holding time exceeded for tests | Inappropriate container for tests |
|---|---|---|---|---|---|
| 1079383 | P2 8.31 WATER | 04/11/16 | GB 1L x3, GV x2 | | |

Key: G-Glass B-Bottle V-Vial

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

## Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

# APPENDIX 5

# MONITORING

IAN FARMER ASSOCIATES
Geotechnical & Environmental Specialists

# Gas and Groundwater Monitoring Results

| | | | |
|---|---|---|---|
| **Contract Number:** | *41976* | **Gas Monitor:** | *GA5000* |
| **Contract Name:** | *Thurnscoe* | **Readings Taken By:** | *NM* |
| **Date:** | *4th November 2016* | **Checked By:** | *HH* |

| **Background Readings:** | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Weather Conditions: | *Dry, cloudy 9.1C* | $O_2$% v/v | $CO_2$% v/v | $CH_4$% v/v | CO ppm | $H_2S$ ppm |
| | Ground Conditions (dry / wet etc): | *Damp* | | | | | |
| | Atmospheric Pressure (Start): | *1000mb* | *20.9* | *0.0* | *0.0* | *0.0* | *0.0* |
| | Atmospheric Pressure (Finish): | *1000mb* | | | | | |
| | Time (Start): 12.00 Time (Finish): | 13:00 | | | | | |

| Hole No: | VOC ppm | $O_2$% v/v | $CO_2$% v/v | $CH_4$% v/v | | CO ppm | $H_2S$ ppm | Rel Pressure (mb) | Gas flow Rate (l/hr) | Depth to base of well | SWL | LNAPL or DNAPL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Steady | Steady | Steady | Peak | Steady | Steady | Steady | Steady | Range | mBGL | mBGL | mBGL |
| *BH01* | *0.0* | *3.0* | *3.9* | *0.0* | *0.0* | *0* | *0* | *0.00* | *0.0* | *4.75* | *Dry* | *n/d* |
| *BH04* | *0.0* | *3.3* | *5.8* | *0.1* | *0.1* | *0* | *0* | *0.00* | *0.0* | *5.39* | *Dry* | *n/d* |
| *P02* | *0.0* | *20.0* | *0.9* | *0.0* | *0.0* | *0* | *0* | *0.00* | *0.0* | *17.90* | *8.31* | *n/d* |
| *BH06* | *0.0* | *11.4* | *4.5* | *0.0* | *0.0* | *0* | *0* | *0.00* | *0.0* | *5.38* | *Dry* | *n/d* |
| | | | | | | | | | | | | |
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| | | | | | | | | | | | | |

>>>> = Flow above detection limit of 30 l/hr, <<< = Negative flow greater than -10 l/hr. >Max = In excess of lower explosive limit.

Remarks:

IAN FARMER ASSOCIATES
Geotechnical & Environmental Specialists

# Gas and Groundwater Monitoring Results

| | | | |
|---|---|---|---|
| **Contract Number:** | *41976* | **Gas Monitor:** | *GA5000* |
| **Contract Name:** | *Thurnscoe* | **Readings Taken By:** | *DM* |
| **Date:** | *16th November 2016* | **Checked By:** | *HH* |

| **Background Readings:** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Weather Conditions: | *Bright, windy, 10°c* | $O_2$% v/v | $CO_2$% v/v | $CH_4$% v/v | CO ppm | $H_2S$ ppm |
| | Ground Conditions (dry / wet etc): | *Wet* | | | | | |
| | Atmospheric Pressure (Start): | *1003mb* | *21.0* | *0.0* | *0.0* | *0.0* | *0.0* |
| | Atmospheric Pressure (Finish): | *1002mb* | | | | | |
| | Time (Start): 12:00 Time (Finish): | 12:45 | | | | | |

| Hole No: | VOC ppm | $O_2$% v/v | $CO_2$% v/v | $CH_4$% v/v | | CO ppm | $H_2S$ ppm | Rel Pressure (mb) | Gas flow Rate (l/hr) | Depth to base of well | SWL | LNAPL or DNAPL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Steady | Steady | Steady | Peak | Steady | Steady | Steady | Steady | Range | mBGL | mBGL | mBGL |
| *BH01* | *0.0* | *20.1* | *0.3* | *0.0* | *0.0* | *0* | *0* | *0.03* | *0.0* | *4.76* | *4.52* | *N/D* |
| *BH04* | *0.0* | *20.8* | *0.1* | *0.0* | *0.0* | *0* | *0* | *-0.08* | *-0.1* | *5.41* | *5.17* | *N/D* |
| *BH06* | *0.0* | *20.7* | *0.2* | *0.0* | *0.0* | *0* | *0* | *0.14* | *0.1* | *5.39* | *Dry* | *N/D* |
| *P02* | *0.0* | *19.3* | *0.7* | *0.0* | *0.0* | *0* | *0* | *0.24* | *0.1* | *17.72* | *7.74* | *N/D* |
| | | | | | | | | | | | | |
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| | | | | | | | | | | | | |

>>>> = Flow above detection limit of 30 l/hr, <<< = Negative flow greater than -10 l/hr. >Max = In excess of lower explosive limit.

Remarks:

IAN FARMER ASSOCIATES
Geotechnical & Environmental Specialists

# Gas and Groundwater Monitoring Results

| | | | |
|---|---|---|---|
| **Contract Number:** | *41976* | **Gas Monitor:** | *GA5000* |
| **Contract Name:** | *Thurnscoe* | **Readings Taken By:** | *DM* |
| **Date:** | *24th November 2016* | **Checked By:** | *HH* |

| **Background Readings:** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Weather Conditions: | *Dull, breezy, dry, 5°C* | $O_2$% v/v | $CO_2$% v/v | $CH_4$% v/v | CO ppm | $H_2S$ ppm | | | | | |
| | Ground Conditions (dry / wet etc): | *Wet* | | | | | | | | | | |
| | Atmospheric Pressure (Start): | *1023mb* | *21.3* | *0.0* | *0.0* | *0.0* | *0.0* | | | | | |
| | Atmospheric Pressure (Finish): | *1024mb* | | | | | | | | | | |
| | Time (Start): 12:00 Time (Finish): | 12:45 | | | | | | | | | | |

| Hole No: | VOC ppm | $O_2$% v/v | $CO_2$% v/v | $CH_4$% v/v | | CO ppm | $H_2S$ ppm | Rel Pressure (mb) | Gas flow Rate (l/hr) | Depth to base of well | SWL | LNAPL or DNAPL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Steady | Steady | Steady | Peak | Steady | Steady | Steady | Steady | Range | mBGL | mBGL | mBGL |
| *BH01* | *0.0* | *13.6* | *0.8* | *0.0* | *0.0* | *0* | *0* | *0.22* | *0.1* | *4.76* | *4.46* | *N/D* |
| *BH04* | *0.0* | *19.6* | *0.5* | *0.0* | *0.0* | *0* | *0* | *0.17* | *0.1* | *5.42* | *5.13* | *N/D* |
| *BH06* | *0.0* | *16.1* | *2.5* | *0.0* | *0.0* | *0* | *0* | *0.03* | *0.0* | *5.38* | *Dry* | *N/D* |
| *P02* | *0.0* | *19.2* | *0.7* | *0.0* | *0.0* | *2* | *0* | *4.96* | *2.2* | *17.75* | *7.89* | *N/D* |
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| | | | | | | | | | | | | |

>>>> = Flow above detection limit of 30 l/hr, <<< = Negative flow greater than -10 l/hr. >Max = In excess of lower explosive limit.

Remarks:

# APPENDIX 6

# PHOTOGRAPHS

# Trial Pit Photographs
# TP01



# Trial Pit Photographs
# TP01





# Trial Pit Photographs
# TP02



# Trial Pit Photographs
# TP02





# Trial Pit Photographs
# TP03



# Trial Pit Photographs
# TP03





# Trial Pit Photographs
# TP04



# Trial Pit Photographs
# TP04





# Trial Pit Photographs
# TP05



# Trial Pit Photographs
# TP05





# Trial Pit Photographs
# TP06



# Trial Pit Photographs
# TP06





# Trial Pit Photographs
# TP06



# Trial Pit Photographs
# TP07



# Trial Pit Photographs
# TP07





# Trial Pit Photographs
# TP08



# Trial Pit Photographs
# TP08





# Trial Pit Photographs
# TP09



# Trial Pit Photographs
# TP09





# Trial Pit Photographs
# TP09



# Trial Pit Photographs
# TP09



