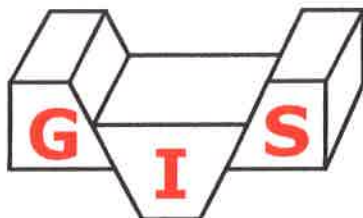

GROUND INVESTIGATION
FOR
PROPOSED INDUSTRIAL DEVELOPMENT
AT
NARROWBOAT WAY
HURST BUSINESS PARK
BRIERLEY HILL

CLIENT: SSAB SWEDISH STEEL LIMITED

DATE: SEPTEMBER 2018 **REPORT NO:** 1888 A

**GROUND INVESTIGATION
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1.0 INTRODUCTION

Following the desk study investigation carried out by GIS (Report No. 1888, July 2018), Ground Investigation Specialists Limited were instructed by CBRE Limited to undertake an intrusive ground investigation for the site located adjacent to SSAB Swedish Steel Ltd at Narrowboat Way, Hurst Business Park, Brierley Hill, DY5 1UF, for potential future industrial development.

The desk study confirmed that, whilst the site had not seen significant development itself, it was in a mining area and contained spoil heaps, as well as lying adjacent to industrial factories and a historic landfill site. A risk of shallow mine workings was also identified. The desk study recommended the need for an intrusive ground investigation in order to determine the presence of shallow mine workings and certain geotechnical/geoenvironmental characteristics of the near surface soils.

Fieldwork was carried out between 17th and 23rd August 2018 and consisted of sinking five boreholes by percussive windowless sampling techniques and five boreholes by rotary open hole drilling techniques.

This report presents a factual account of the works undertaken and gives a geotechnical appraisal of the soil conditions in respect of foundations for the proposed development. The general aspects of chemical concentrations in respect of the presence of certain contaminants on the site are also included.

This report is for the sole use of SSAB Swedish Steel Limited and their advisors in support of a new industrial development at Narrowboat Way, Brierley Hill. No liability can be accepted for its use by other parties or for other developments proposals.

2.0 SITE INVESTIGATION

2.1 Fieldwork

All fieldworks were carried out between 17th and 23rd August 2018 and consisted of sinking five boreholes (WS1 – WS5) by percussive windowless sampling methods and five boreholes (R1 – R5) by rotary open hole drilling methods. The locations of all the exploratory holes were set out and cleared for services by GIS and are shown on the site plan in section 11.0.

2.1.1 Percussive Windowless Sampling Boreholes (WS1 – WS5)

On 17th August 2018, a fully tracked Premier drilling rig was mobilised to sink five boreholes by percussive windowless sampling methods to depths ranging between 1.1 m (WS4) and 6.3 m (WS2).

From ground level, continuous 1.0 m long undisturbed samples were taken to ensure a complete soil profile to the base of each borehole. The samples of a diameter reducing from 100 mm were then described and sub-sampled on site by a ground engineer who produced the logs appended to this report in section 6.0.

In situ Standard Penetration Tests (SPTs) were carried out at 1.0 m intervals from a depth of 1.0 m to determine the relative density or strength of the underlying strata.

On completion, a standpipe was installed in borehole WS2 to a depth of 6.0 m in order to carry out ground gas and groundwater monitoring. The installation comprised 1.0 m of plain pipe onto 5.0 m of slotted pipe fitted with a gravel surround, bentonite seal, bung and tap and security cover flush with ground level.

All the other boreholes were backfilled with arisings on completion.

2.1.2 Rotary Open Hole Boreholes (R1 – R5)

Between 20th and 23rd August 2018, five open boreholes (R1 – R5) were sunk by means of a fully mobilised Hands England rotary drilling rig. All boreholes were sunk to a depth of 50.0 m, with the exception of R4 which struck buried obstructions (suspected concrete or slag boulders) on several attempts at depths of c. 1.5 m. Arisings from each borehole were flushed to the surface by means of pressurised water and logged by the driller. Their findings are presented on the borehole logs included in section 7.0.

2.2 Laboratory Testing

GIS specified the following schedule of laboratory testing. The results are presented in section 9.0.

Five samples of the made ground have been tested for a general suite of likely contaminants including asbestos, arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, zinc, Speciated Polyaromatic Hydrocarbons (PAHs) and banded Total Petroleum Hydrocarbons (TPHs) (from C₈ to C₃₅), along with their soil organic matter (SOM).

One sample of made ground underwent a full suite of Waste Acceptance Criteria (WAC) tests, in order to determine the classification of the material for landfill disposal.

With regard to assessing conditions aggressive to buried concrete, four samples of made ground and one sample of natural soil were tested for their water-soluble sulphate content and pH value.

3.0 GROUND CONDITIONS

3.1 Strata Encountered

Full details of the strata encountered are presented on the borehole logs included in sections 6.0 and 7.0. However, as a brief guide, the main engineering geology horizons are described below.

Made Ground

All boreholes encountered made ground typical of foundry type waste over coal mining pit waste, to depths of 4.1 m (WS2) and 6.5 m (R1) and comprising loose dark grey to black ashy silty sand with slag boulders and then grey sandy clay, containing pockets of crushed coal and fragments of mudstone, sandstone, coal, slag, ash, brick, concrete, limestone, siltstone and burnt shale.

Pennine Middle Coal Measures Formation

Borehole WS2 encountered the anticipated bedrock of the Pennine Middle Coal Measures Formation (PMCM), comprising soft becoming very stiff laminated and friable orange-brown and grey mottled very silty clay with many lithorelicts of extremely weak mudstone and siltstone, increasing with depth.

Rotary boreholes R1, R2, R3 and R5 further proved the PMCM to depths of over 50.0 m, which below an initial thin layer of clay, comprised an interbedded sequence of grey and brown sandstone and mudstone.

Boreholes R2, R3 and R5 encountered the Thick coal seam at depths of 38.8, 40.5 and 39.8 m respectively, comprising an intact thickness of between 2.7 m (R5) and 4.2 m (R2) underlain by broken ground where the lower part of the seam had been worked. In R1 all the coal appears to have been mined with broken ground and a total loss of flush returns recorded between 37.5 and 43.3 m.

3.2 Groundwater

During the drilling works groundwater was encountered in WS1 at a depth of 5.3 m, which had risen to 4.9 m on completion. All the other windowless sampling boreholes remained dry for the short period of time they were open.

Later monitoring of the standpipes installed in boreholes WS2 and R5 showed that between 24th August and 14th September 2018 groundwater levels varied between 4.9 m and 3.7 m.

4.0 ENGINEERING DISCUSSION

4.1 Introduction

No firm details are known as to the nature and layout of the proposed industrial development, so at this stage the comments/recommendations given below are of a general nature and may need to be reviewed when more site specific information becomes available.

4.2 Foundations

The rotary investigation has confirmed that the Thick Coal Seam which underlies the site at c. 38 to 47 m depth has been widely worked. At such a relatively shallow depth the mine workings have the potential to i) collapse causing migrating voids to break out close to the surface and cause a loss of bearing capacity and support to the new buildings and/or ii) consolidate due to self weight and foundations loads resulting in excessive settlement of the buildings. To alleviate these risks it will be necessary for all but the lightest of structures to stabilise the workings by undertaking a grid drilling and pressure grout operation before the new buildings are constructed.

The Coal Authority have identified two disused mine shafts on or close to the southern end of the site. Although both have been grouted, building control may require new buildings to be kept a safe distance from them.

With regards to the design of foundations, the exploratory holes have proved made ground consisting predominantly of soft to firm pit waste to depths of between 4.1 and 6.5 m, underlain by a thin layer of clay and then interbedded mudstones and sandstones of the PMCM. Uncorrected SPT N values within the made ground showed a marked variation ranging from <2 (based on 2 blows for 450 mm penetration) to 26, with a mean of 9 taken from 12 readings.

It is concluded that for all but the lightest of new structures, which could possibly be constructed on a semi-rigid raft foundation, the made ground is not likely to be a suitable bearing stratum for the new foundations due to variations in its composition and relative density/ strength, without some form of pre-treatment. The preferred method of treatment would involve the installation of vibro stone columns to iron out the variability of the made ground, improve bearing capacity and to reduce ground compressibility and differential settlement. Reference should be made to the specialist contractors who from the knowledge of their individual design and the information contained in this report would best be able to advise

on the detailed construction. Following ground treatment new buildings could be constructed on shallow reinforced foundations with load bearing floor slabs.

4.3 Buried Concrete

The water-soluble sulphate and pH value testing carried out on five samples of soil would indicate that in terms of buried concrete and classifying the site as to its Aggressive Chemical Environment for Concrete (ACEC) the site could be considered to have an ACEC Class of AC-1 as detailed in the BRE Special Digest 1:2005.

5.0 CONTAMINATION ASSESSMENT

5.1 Soil Contamination

Five samples of made ground have been tested for asbestos, metals/metalloids, speciated PAH, banded TPH and SOM. All the test results are included in section 9.0.

The results have been compared with Generic Assessment Criteria (GAC) for commercial use known as 'Suitable 4 Use Levels – S4UL', derived using the Contaminated Land Environmental Assessment 'CLEA' v1.06 software methodology by the Land Quality Management (LQM)/ Chartered Institute of Environmental Health (CIEH) with the exception of lead for which a Category 4 Screening Level (C4SL) for commercial use has been provided, as published by DEFRA. All the S4ULs for the PAHs and TPHs are appropriate to a SOM content of 6 % (based on the mean of the measured results).

Table 1 (overleaf) provides a statistical summary of the solid suite analysis data and comparison with the appropriate screening values. Each contaminant data set has been assessed as to whether it exhibits a "normal" or "non-normal" distribution using a probability Q-q plot, as detailed in the 2008 CIEH/CL:AIRE guidance document "Comparing Soil Contamination Data with a Critical Concentration". Where normally distributed data are present, the "one

sample t-test” has been used to produce a “true mean concentration of the contaminant, or 95% upper confidence limit (μ)”. Where non-normal data is evident, μ is calculated using the Chebyshev theorem of probability. The results of these calculations can be provided upon request.

As recommended by the Health Protection Agency (2010), a comparison of the ratios of certain PAHs identified in the samples was made with published coal tar data in order that the benzo(a)pyrene surrogate marker approach could be utilised in the risk assessment. From the levels of PAH identified and resulting ratios produced, the benzo(a)pyrene identified was deemed representative of coal tar, and as such the more conservative S4UL has been used in the assessment.

The banded TPH results have no aliphatic/aromatic segregation; therefore, the more conservative of the two S4ULs have been used for comparing the analysis data.

**Table 1: Summary of Made Ground Analysis Data for Metals, Metalloids, pH, PAH and
TPH**

| Determinand | Units | Count | Min | Max | μ | | Screen | Source | No. Exceeding Screen |
|------------------------------------|--------------|--------------|------------|------------|----------|------|---------------|---------------|-----------------------------|
| Arsenic | mg/kg | 5 | 7 | 9.4 | T | 9.02 | 640 | S4UL | 0 |
| Cadmium | mg/kg | 5 | 0.3 | 0.9 | T | 0.80 | 190 | S4UL | 0 |
| Chromium | mg/kg | 5 | 36 | 1084 | C | 1190 | 8600 | S4UL | 0 |
| Copper | mg/kg | 5 | 36 | 142 | T | 117 | 68000 | S4UL | 0 |
| Lead | mg/kg | 5 | 36 | 164 | T | 124 | 2330 | C4SL | 0 |
| Mercury | mg/kg | 5 | <0.5 | <0.5 | C | <0.5 | 1100 | S4UL | 0 |
| Nickel | mg/kg | 5 | 28 | 36 | T | 36.0 | 980 | S4UL | 0 |
| Selenium | mg/kg | 5 | 0.7 | 1.7 | T | 1.55 | 12000 | S4UL | 0 |
| Zinc | mg/kg | 5 | 174 | 209 | T | 210 | 730000 | S4UL | 0 |
| pH | - | 5 | 7.4 | 8.5 | - | - | <5 | ARB | 0 |
| Naphthalene | mg/kg | 5 | 0.01 | 0.99 | C | 1.06 | 1100 | S4UL | 0 |
| Acenaphthylene | mg/kg | 5 | <0.01 | 0.07 | T | 0.06 | 100000 | S4UL | 0 |
| Acenaphthene | mg/kg | 5 | <0.01 | 0.05 | T | 0.05 | 100000 | S4UL | 0 |
| Fluorene | mg/kg | 5 | 0.01 | 0.04 | T | 0.04 | 71000 | S4UL | 0 |
| Phenanthrene | mg/kg | 5 | 0.13 | 0.93 | T | 0.76 | 23000 | S4UL | 0 |
| Anthracene | mg/kg | 5 | <0.02 | 0.15 | C | 0.23 | 540000 | S4UL | 0 |
| Fluoranthene | mg/kg | 5 | 0.13 | 1.53 | T | 1.32 | 23000 | S4UL | 0 |
| Pyrene | mg/kg | 5 | 0.11 | 1.36 | T | 1.17 | 54000 | S4UL | 0 |
| Benzo[a]anthracene | mg/kg | 5 | 0.04 | 0.63 | T | 0.61 | 180 | S4UL | 0 |
| Chrysene | mg/kg | 5 | 0.10 | 0.72 | T | 0.71 | 350 | S4UL | 0 |
| Benzo[b]fluoranthene | mg/kg | 5 | 0.07 | 1.23 | T | 1.10 | 45 | S4UL | 0 |
| Benzo[k]fluoranthene | mg/kg | 5 | <0.02 | 0.47 | T | 0.42 | 1200 | S4UL | 0 |
| Benzo[a]pyrene | mg/kg | 5 | 0.02 | 0.76 | T | 0.74 | 15 | S4UL | 0 |
| Indeno[1,2,3-cd]pyrene | mg/kg | 5 | <0.02 | 0.83 | T | 0.71 | 510 | S4UL | 0 |
| Dibenzo[a,h]anthracene | mg/kg | 5 | <0.02 | 0.18 | T | 0.14 | 3.6 | S4UL | 0 |
| Benzo[g,h,i]perylene | mg/kg | 5 | 0.05 | 0.92 | T | 0.78 | 4000 | S4UL | 0 |
| >C ₈ - C ₁₀ | mg/kg | 5 | <0.1 | <0.1 | C | <0.1 | 11000 | S4UL | 0 |
| >C ₁₀ - C ₁₂ | mg/kg | 5 | <4 | 9 | C | 9.40 | 34000 | S4UL | 0 |
| >C ₁₂ - C ₁₆ | mg/kg | 5 | 6 | 60 | C | 64.0 | 38000 | S4UL | 0 |
| >C ₁₆ - C ₂₁ | mg/kg | 5 | 17 | 146 | T | 110 | 28000 | S4UL | 0 |
| >C ₂₁ - C ₃₅ | mg/kg | 5 | 119 | 823 | T | 610 | 28000 | S4UL | 0 |

C4SL = DEFRA commercial land use Category 4 Screening Level for Lead.

S4UL = Suitable 4 USE Levels developed by LQM/CIEH for commercial use (6.0% SOM for organic contaminants).

ARB = Arbitrary.

Breaches are highlighted in yellow and statistical outliers in purple (where relevant).

Reference to Table 1 shows that none of the determinands tested had concentrations which exceeded their relevant screening values.

The five samples were also screened for the presence of asbestos, of which none was detected.

No further risk assessment is considered necessary in respect of these results and no remedial works will be required to protect the health of end-users.

As a standard precautionary measure, groundworkers involved in the construction works should wear standard PPE as normal (i.e. gloves, overalls, boots, helmets etc). A good standard of personal hygiene should be adopted, with the regular washing of hands particularly before food is consumed.

5.2 Classification of Soil for Off-Site Disposal

In respect of determining the suitability of the made ground present on site for disposal to landfill, waste classification software has been used to identify whether the material can be classified as hazardous or non-hazardous, as defined in the EWC (European Waste Catalogue 2002).

Each determinand was compared with the appropriate/ most likely chemical compounds as detailed in EWC Chapter 17 - Construction and demolition wastes. Full details of the classification are provided on the appended data sheets included in section 10.0.

Based on an assessment of the solid test results, the made ground waste stream would be classified at this stage as “Non-Hazardous Waste”.

In order to now establish its suitability for disposal to an inert waste landfill, Waste Acceptance Criteria (WAC) testing has been carried out on the sample taken from a depth of 0.4 m in WS3.

The results of the WAC testing reveal that the made ground exceeds the Inert Waste Limit Values for total organic carbon (3.4 % compared with a screening value of 3 %) and fluoride (18 mg/kg compared with a screening value of 10 mg/kg). As such, without pre-treatment the made ground would not be acceptable at an inert waste landfill and should be taken to a non-hazardous waste landfill. Discussion should be had with the landfill operator to agree acceptance and negotiate tipping costs.

5.3 Ground Gas Contamination

Monitoring for ground gases was undertaken on three occasions between 24th August and 14th September 2018, the full results of which are included in section 8.0. Table 2 (below) presents a summary of the monitoring data.

Table 2: Summary of Ground Gas Monitoring Data

| <u>Borehole</u> | <u>Response Zone (mbgl)</u> | <u>No. of Monitoring Occasions</u> | <u>Methane (% v/v)</u> | <u>Carbon Dioxide (% v/v)</u> | <u>Oxygen (% v/v)</u> | <u>Steady Positive Flow (l/hr)</u> | <u>Water Level (mbgl)</u> | <u>Atmospheric Pressure Range (mBar)</u> |
|------------------------|------------------------------------|---|-------------------------------|--------------------------------------|------------------------------|---|----------------------------------|---|
| <u>WS2</u> | 1.0 – 6.0 | 3 | <0.1 | 14.7 – 16.2 | 0.4 – 1.9 | 0 | 4.85 – 4.93 | 995 – 1006 |
| <u>R5</u> | 1.0 – 4.0 | 3 | <0.1 | 9.7 – 10.5 | 5.1 – 7.5 | 0 | Dry – 3.65 | 995 - 1006 |

No methane or steady positive flow was detected in either borehole. However, elevated levels of carbon dioxide and depleted levels of oxygen were recorded on all three monitoring occasions in both boreholes.

Based on these results, and referring to the guidance set out in BS 8485:2015, a Borehole Hazardous Gas Flow Rate (Q_{hg}) should be derived using the following equation:-

$$Q_{hg} = q \frac{(C_{hg})}{100} \text{ l/h}$$

Where q is the measured flow rate (in litres per hour);

And C_{hg} is the measured hazardous gas concentration (in percentage volume/volume).

Assuming a worst case steady positive of flow of 0.1 l/hr, the Q_{hg} 's for methane and carbon dioxide are calculated below:-

Methane:

$$Q_{hg}CH_4 = 0.1 \frac{(0.1)}{100} = 0.0001 \text{ l/h}$$

Carbon Dioxide:

$$Q_{hg}CO_2 = 0.1 \frac{(16.2)}{100} = 0.0162 \text{ l/h}$$

A typical gas screening value (GSV) of 0.0162 l/hr can be assigned based on the Q_{hg} for carbon dioxide. This GSV would put the site in the lowest "Characteristic Situation" (CS1) from the Modified Wilson & Card classification. However, in accordance with the guidance, an increase to CS2 should be considered where carbon dioxide concentrations of >5 % are recorded.

Table 4 of the guidance shows that low risk commercial/ industrial buildings on CS2 sites will require specialist gas protective measures, equivalent to a gas protection score of 1.5.

Given the recommended foundation solutions discussed in section 4.0 and with reference to Table 5 of the guidance, a well reinforced cast in situ monolithic ground bearing raft with minimal penetrations could achieve a gas protection score of 1.5, without the need for further protective measures such as a gas resistant membrane.

**C.S. Noakes, MSci., FGS.
Ground Engineer**

**H.S. Lister, BSc., C. Geol., C Sci., FGS.,
Director**

Ground Investigation Specialists Limited

6.0 PERCUSSIVE WINDOWLESS SAMPLING BOREHOLE LOGS

GROUND INVESTIGATION SPECIALISTS LIMITED

| | | | |
|------------------------|---|--|--|
| BOREHOLE RECORD | BORING COMMENCED: 17.08.18 BORING COMPLETED: 17.08.18 GROUND LEVEL: | TYPE OF BORING: Windowless Sampling DIAMETER OF HOLE: 100 - 50 mm BOREHOLE CASING: 1.0 m | CLIENT: CBRE Limited ENGINEER: CONTRACT: Narrowboat Way, Brierley Hill |
| | | | BOREHOLE: WS1 SHEET: 1 OF 1 JOB NO: 1888 |

DRILLING

SAMPLES

RESULTS OF TESTS

| DESCRIPTION OF STRATA | LEGEND | WATER LEVEL | THICKNESS | DEPTH | Reduced Level | DEPTH | TYPE | INDEX PROPERTIES | | | | DENSITIES | | STRENGTH TESTS | | IN-SITU CHEMICAL AND OTHER TESTS AND REMARKS (SPT Blows) |
|--|--------|-------------|-----------|-------|---------------|-------|------|------------------|------|------|------|-----------|--------------------------|--------------------------|--------------|---|
| | | | | | | | | 'N' VALUE | MC % | LL % | PL % | PI | WET (kg/m ³) | DRY (kg/m ³) | COHESION kPa | |
| Made ground (loose dark grey to black silty SAND with many pockets of crushed coal, some fine to cobble sized angular fragments of ash, concrete, limestone, siltstone, burnt shale and many rootlets). | X | | 1.81 | 1.81 | | 0.30 | E1 | | | | | | | | | (1.2.1.1.2.1.) |
| Made ground (soft to firm dark grey to black and orange mottled silty very sandy CLAY with many fine to cobble sized angular fragments of mudstone, coal and ash, many pockets of crushed coal and many rootlets). | X | | 4.14 | 4.14 | | 2.00 | S3 | 4 | | | | | | | | (1.1.1.1.1.1.) |
| burnt shale and brick fragments from 5.0 m. | X | | | 5.30 | | 2.50 | D4 | | | | | | | | | pH Value = 7.2 Water Soluble SO ₄ (2:1) = 62 mg/l |
| | X | | | 3.00 | | 3.00 | S5 | 8 | | | | | | | | (2.2.2.2.2.2.) |
| | X | | | 4.00 | | 4.00 | S6 | 11 | | | | | | | | (2.2.2.3.3.3.) |
| | X | | | 5.00 | | 5.00 | S7 | 7 | | | | | | | | (6.7.2.2.1.2.) |
| | X | | | 5.50 | | 5.50 | S8 | 7 | | | | | | | | (10.5.1.2.2.2.) |
| | X | | | 5.95 | | 5.95 | D9 | | | | | | | | | |



GROUNDWATER OBSERVATIONS:

Water encountered at 5.30 m rose to 4.85 m by completion of drilling.

▽ - Final groundwater level
 ▽ - Groundwater first struck
 ▲ - Standpipe
 ● - Piezometer

W - Water Sample
 B - Bulk Sample
 J - Jar Sample
 E - Environmental Suite

M/C - Natural Moisture Content
 LL - Liquid Limit
 PL - Plastic Limit
 PI - Plasticity Index

'N' - Standard or Cone Penetration Test Result
 T - Undrained Triaxial
 M - Multi-stage Undrained Triaxial

S - Standard Penetration Test
 C - Cone Penetration Test
 V - Pocket Vane Test
 SO₄ - Soluble Sulphate Analysis

GROUND INVESTIGATION SPECIALISTS LIMITED

| | | | |
|------------------------|----------------------------|-------------------------------------|---|
| BOREHOLE RECORD | BORING COMMENCED: 17.08.18 | TYPE OF BORING: Windowless Sampling | CLIENT: CBRE Limited |
| | BORING COMPLETED: 17.08.18 | DIAMETER OF HOLE: 100 - 50 mm | ENGINEER: |
| | GROUND LEVEL: | BOREHOLE CASING: 1.0 m | CONTRACT: Narrowboat Way, Brierley Hill |
| | | | BOREHOLE: WS2 |
| | | | SHEET: 1 OF 1 |
| | | | JOB NO: 1888 |

| DESCRIPTION OF STRATA | LEGEND | WATER LEVEL | THICKNESS | DEPTH | REDUCED LEVEL | DEPTH | TYPE | INDEX PROPERTIES | | | | DENSITIES | | | | STRENGTH TESTS | | IN-SITU CHEMICAL AND OTHER TESTS AND REMARKS | |
|--|--------|-------------|-----------|-------|---|-------|------|------------------|-------|---|------|-----------|--------------------------|--------------------------|---|----------------|--------------------------------------|--|--|
| | | | | | | | | N VALUE | M/C % | LL % | PL % | PI % | WET (kg/m ³) | DRY (kg/m ³) | TYPE | COHESION (kPa) | ANGLE OF INTERNAL FRICTION (degrees) | | COHESION (kPa) |
| Made ground (soft to firm dark brownish-grey to black silty slightly sandy ashly CLAY with some thick bands of crushed coal and many fine to cobble sized angular fragments of mudstone, sandstone, brick, concrete, ash, burnt shale and coal and some rootlets). | X | | 4.10 | GL | | 0.20 | E1 | | | | | | | | | | | | |
| Soft becoming very stiff laminated friable orange-brown and grey mottled very silty CLAY with many increasing fine to coarse angular lithoclasts of extremely weak mudstone and siltstone. (Weathered PENNINE MIDDLE COAL MEASURES FORMATION) | X | | 4.10 | | | 1.00 | S2 | | | | | | | | | | | | (1.---1.---) |
| | X | | 4.10 | | | 2.00 | S3 | | | | | | | | | | | | (1.1.3.6.3.4) |
| | X | | 4.10 | | | 3.00 | S4 | 8 | | | | | | | | | | | (2.2.2.2.2.2) |
| | X | | 4.10 | | | 4.00 | S5 | | | | | | | | | | | | (3.1.---1.---) |
| | X | | 4.10 | | | 5.00 | S6 | 25 | | | | | | | | | | | (3.6.5.6.6.8) |
| Borehole Complete. Standpipe installed to 6.0 m (1.0 m plain pipe onto 5.0 m slotted pipe) | X | | 6.00 | | | 5.80 | D7 | | | | | | | | | | | | pH Value = 7.7 |
| | X | | 6.32 | | | 6.00 | S8 | | | | | | | | | | | | Water Soluble SO ₄ (2:1) = 140 mg/l (9.14.18.26.6 for 20 mm) |
| GROUNDWATER OBSERVATIONS: <ul style="list-style-type: none"> ▼ - Final groundwater level ▽ - Groundwater first struck ▲ - Standpipe ● - Piezometer | | | | | | | | | | | | | | | | | | | |
| DRILLING | | | | | SAMPLES | | | | | RESULTS OF TESTS | | | | | IN-SITU CHEMICAL AND OTHER TESTS AND REMARKS | | | | |
| GROUNDWATER OBSERVATIONS: | | | | | SAMPLES | | | | | RESULTS OF TESTS | | | | | IN-SITU CHEMICAL AND OTHER TESTS AND REMARKS | | | | |
| W - Water Sample B - Bulk Sample J - Jar Sample E - Environmental Suite | | | | | MC - Natural Moisture Content LL - Liquid Limit PL - Plastic Limit PI - Plasticity Index | | | | | N' - Standard or Cone Penetration Test Result T - Undrained Triaxial M - Multi-stage Undrained Triaxial | | | | | S - Standard Penetration Test C - Cone Penetration Test V - Pocket Vane Test SO ₃ - Soluble Sulphate Analysis | | | | |


GROUND INVESTIGATION SPECIALISTS LIMITED

| | | | | | | | | | | |
|------------------------|----------------------------|----------------------------|---------------|-------------------------------------|-------------------------------|------------------------|----------------------|-----------|---|---------------|
| BOREHOLE RECORD | BORING COMMENCED: 17.08.18 | BORING COMPLETED: 17.08.18 | GROUND LEVEL: | TYPE OF BORING: Windowless Sampling | DIAMETER OF HOLE: 100 - 50 mm | BOREHOLE CASING: 1.0 m | CLIENT: CBRE Limited | ENGINEER: | CONTRACT: Narrowboat Way, Brierley Hill | BOREHOLE: WS3 |
| | | | | | | | | | | SHEET: 1 OF 1 |
| | | | | | | | | | | JOB NO: 1888 |

DRILLING

SAMPLES

RESULTS OF TESTS

| DESCRIPTION OF STRATA | LEGEND | WATER LEVEL | THICKNESS | DEPTH | Reduced Level | DEPTH | TYPE | INDEX PROPERTIES | | | | DENSITIES | | STRENGTH TESTS | | IN-SITU CHEMICAL AND OTHER TESTS AND REMARKS (SPT Blows) | | |
|--|--|-------------|-----------|-------|---------------|-------|------|----------------------|------|------|------|-----------|--------------------------|--------------------------|----------------|--|----------------|---|
| | | | | | | | | N ^o VALUE | MC % | LL % | PL % | PI | WET (kg/m ³) | DRY (kg/m ³) | TYPE | | COHESION (kPa) | ANGLE OF FRICTION (degrees) |
| Made ground (grey and brown intermixed slightly silty, slightly sandy, slightly gravelly CLAY with many fine to cobble sized angular fragments of mudstone, coal, sandstone, brick, concrete, slag, ash, burnt shale, occasional pockets of crushed coal and occasional rootlets). |  | | 2.80 | GL | | 0.40 | E1 | | | | | | | | | | | |
| | | | | 1.00 | S2 | 9 | | | | | | | | | (2.1.2.2.3.2.) | | | |
| | | | | 2.00 | S3 | 5 | | | | | | | | | (2.1.1.2.1.1.) | | | |
| Borehole refused on buried obstruction. | | | | 2.80 | | 2.70 | D4 | | | | | | | | | | | pH Value = 6.1 Water Soluble SO ₄ (2:1) = 88 mg/l |

GROUNDWATER OBSERVATIONS:

| | |
|---|--|
| <p> ▽ - Final groundwater level ▽ - Groundwater first struck ▲ - Standpipe ● - Piezometer </p> | <p> W - Water Sample B - Bulk Sample J - Jar Sample E - Environmental Suite </p> <p> MC - Natural Moisture Content LL - Liquid Limit PL - Plastic Limit PI - Plasticity Index </p> <p> N^o - Standard or Cone Penetration Test Result T - Undrained Triaxial M - Multi-stage Undrained Triaxial </p> <p> S - Standard Penetration Test C - Cone Penetration Test V - Pocket Vane Test SO₄ - Soluble Sulphate Analysis </p> |
|---|--|

GROUND INVESTIGATION SPECIALISTS LIMITED

| | | | |
|------------------------|---|--|--|
| BOREHOLE RECORD | BORING COMMENCED: 17.08.18 BORING COMPLETED: 17.08.18 GROUND LEVEL: | TYPE OF BORING: Windless Sampling DIAMETER OF HOLE: 100 - 50 mm BOREHOLE CASING: 0.9 m | CLIENT: CBRE Limited ENGINEER: CONTRACT: Narrowboat Way, Brierley Hill |
| | | | BOREHOLE: WS4 SHEET: 1 OF 1 JOB NO: 1888 |

DRILLING

SAMPLES

RESULTS OF TESTS

| DESCRIPTION OF STRATA | LEGEND | WATER LEVEL | THICKNESS | DEPTH | Reduced Level | DEPTH | TYPE | INDEX PROPERTIES | | | | DENSITIES | | STRENGTH TESTS | | IN-SITU CHEMICAL AND OTHER TESTS AND REMARKS | | |
|--|--------|-------------|-----------|-------|---------------|-------|------|------------------|-------|------|------|-----------|--------------------------|--------------------------|------|--|---|-----------------------------|
| | | | | | | | | 'N' VALUE | M/C % | LL % | PL % | PI | WET (kg/m ³) | DRY (kg/m ³) | TYPE | | COHESION kPa | ANGLE OF FRICTION (degrees) |
| Made ground (brown slightly silty SAND with many fine to cobble sized angular fragments of ash, burnt shale, brick, concrete, sandstone, siltstone, occasional clay pockets and many rootlets). | X | | | GL | | | | | | | | | | | | | | |
| | | 1.055 | 1.055 | 0.30 | E1 | | | | | | | | | | | | pH Value = 8.5 Water Soluble SO ₄ (2:1) = 177 mg/l (25 for 70 mm, 44, 6 for 10 mm) | |
| Borehole refused on buried obstruction. | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| GROUNDWATER OBSERVATIONS: | | | | | | | | | | | | | | | | | | |
| Dry: | | | | | | | | | | | | | | | | | | |
| <ul style="list-style-type: none"> ∇ - Final groundwater level ∇ - Groundwater first struck ▲ - Standpipe ● - Piezometer | | | | | | | | | | | | | | | | | | |
| <ul style="list-style-type: none"> W - Water Sample B - Bulk Sample J - Jar Sample E - Environmental Suite | | | | | | | | | | | | | | | | | | |
| <ul style="list-style-type: none"> M/C - Natural Moisture Content LL - Liquid Limit PL - Plastic Limit PI - Plasticity Index | | | | | | | | | | | | | | | | | | |
| <ul style="list-style-type: none"> 'N' - Standard or Cone Penetration Test Result T - Undrained Triaxial M - Multi-stage Undrained Triaxial | | | | | | | | | | | | | | | | | | |
| <ul style="list-style-type: none"> S - Standard Penetration Test C - Cone Penetration Test V - Pocket Vane Test SO_s - Soluble Sulphate Analysis | | | | | | | | | | | | | | | | | | |

GROUND INVESTIGATION SPECIALISTS LIMITED

| | | | | | | | | | | |
|------------------------|----------------------------|----------------------------|---------------|-----------------------------------|-------------------------------|------------------------|----------------------|-----------|---|---------------|
| BOREHOLE RECORD | BORING COMMENCED: 17.08.18 | BORING COMPLETED: 17.08.18 | GROUND LEVEL: | TYPE OF BORING: Windless Sampling | DIAMETER OF HOLE: 100 - 50 mm | BOREHOLE CASING: 1.0 m | CLIENT: CBRE Limited | ENGINEER: | CONTRACT: Narrowboat Way, Brierley Hill | BOREHOLE: WSS |
| | | | | | | | | | | SHEET: 1 OF 1 |
| | | | | | | | | | | JOB NO: 1888 |












| DESCRIPTION OF STRATA | LEGEND | WATER LEVEL | THICKNESS | DEPTH | Reduced Level | DEPTH | TYPE | INDEX PROPERTIES | | | | WET DENSITIES (kg/m ³) | DRY DENSITIES (kg/m ³) | STRENGTH TESTS COHESION kPa | ANGLE OF FRICTION (degrees) | IN-SITU CHEMICAL AND OTHER TESTS AND REMARKS (SPT Blows) | |
|---|--------|-------------|-----------|-------|---------------|-------|------|------------------|-------|------|------|------------------------------------|------------------------------------|-----------------------------|-----------------------------|--|--|
| | | | | | | | | 'N' VALUE | M/C % | LL % | PL % | | | | | | PI |
| Made ground (dark brown to greyish-brown, slightly silty SAND with many fine to cobble sized angular fragments of concrete, limestone, brick, ash, slag, tile, mudstone, siltstone and coal and some roots and rootlets). | X | | 1.40 | 1.40 | | 0.50 | E1 | | | | | | | | | | pH Value = 8.3 Water Soluble SO ₄ (2:1) = 204 mg/l (5.5, 7.8, 8.5.) |
| Made ground (firm light and dark grey intermixed CLAY with many fine to coarse angular fragments of mudstone, siltstone, coal and ash and occasional rootlets). | X | | 0.685 | 1.40 | | 1.70 | D3 | | | | | | | | | | (13, 12 for 50 mm, 18, 15, 14, 3 for 10 mm) |
| Borehole refused on buried obstruction. | | | | 2.085 | | 1.80 | S4 | | | | | | | | | | |

| | |
|--|---|
| GROUNDWATER OBSERVATIONS: ▽ - Final groundwater level ▽ - Groundwater first struck ▲ - Standpipe ● - Piezometer | W - Water Sample B - Bulk Sample J - Jar Sample E - Environmental Suite |
| M/C - Natural Moisture Content LL - Liquid Limit PL - Plastic Limit PI - Plasticity Index | 'N' - Standard or Cone Penetration Test Result T - Undrained Triaxial M - Multi-stage Undrained Triaxial |
| S - Standard Penetration Test C - Cone Penetration Test V - Pocket Vane Test SO ₄ - Soluble Sulphate Analysis | |

7.0 ROTARY BOREHOLE LOGS

GROUND INVESTIGATION SPECIALISTS LIMITED

| | | |
|--|--|------------------------|
| CONTRACT: Narrowboat Way, Brierley Hill | | BOREHOLE No. R1 |
| CLIENT: CBRE Limited | | SHEET 1 OF 2 |
| ENGINEER: | | JOB No. 1888 |
| DATES DRILLED: 21.08.18 | RIG TYPE: Hands England | DRILLER: MT |
| GROUND LEVEL: | DRILLING METHOD: Rotary open hole-water flush | ANGLE: Vertical |

| Drilling & Casing Progress | Core Recovery % | | | STRATA DESCRIPTION | Legend | Depth (m) | Reduced Level (m) |
|----------------------------|-----------------|---|---|--|--|-----------|-------------------|
| | T | S | R | | | | |
| P.W. casing to 8.0m | | | | Made ground (PIT FILL with ash and slag) |  | GL | |
| | | | | Brown CLAY (Weathered PENNINE MIDDLE COAL MEASURES FORMATION). |  | 6.50 | |
| | | | | Brown SANDSTONE (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 7.50 | |
| | | | | Brownish-grey MUDSTONE with sandstone bands. (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 10.20 | |
| | | | | Grey MUDSTONE with sandstone bands. (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 12.00 | |
| | | | | Grey SANDSTONE with mudstone bands. (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 19.50 | |
| | | | | Grey MUDSTONE with sandstone bands (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 26.50 | |
| | | | | Grey SANDSTONE. (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 31.50 | |
| | | | | Grey MUDSTONE with sandstone bands. (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 32.70 | |
| | | | | Weak drilling – 100% loss of flush returns. |  | 37.50 | |
| | | | | Broken ground. |  | 39.00 | |
| | | | | Borehole continued .../ | | 40.00 | |

| | | |
|---|--|----------------|
| REMARKS: 100% loss of flush returns below 37.5 m. | T = total core recovery S = solid core recovery R = rock quality designation | FIG NO. |
|---|--|----------------|

GROUND INVESTIGATION SPECIALISTS LIMITED

CONTRACT: Narrowboat Way, Brierley Hill

BOREHOLE No. R1

CLIENT: CBRE Limited

SHEET 2 OF 2

ENGINEER:

JOB No. 1888

DATES DRILLED: 21.08.18

RIG TYPE: Hands England

DRILLER: MT

GROUND LEVEL:

DRILLING METHOD: Rotary open hole-water flush

ANGLE: Vertical

STRATA DESCRIPTION












| Drilling & Casing Progress | Core Recovery % | | | Legend | Depth (m) | Reduced Level (m) |
|----------------------------|-----------------|---|---|--------|-----------|-------------------|
| | T | S | R | | | |
| | | | | | 40.00 | |
| | | | | | 43.00 | |
| | | | | | 50.00 | |

REMARKS: 100% loss of flush returns below 37.5 m

T = total core recovery
 S = solid core recovery
 R = rock quality designation

FIG NO.

| | | |
|--|--|------------------------|
| CONTRACT: Narrowboat Way, Brierley Hill | | BOREHOLE No. R2 |
| CLIENT: CBRE Limited | | SHEET 1 OF 2 |
| ENGINEER: | | JOB No. 1888 |
| DATES DRILLED: 20.08.18 | RIG TYPE: Hands England | DRILLER: MT |
| GROUND LEVEL: | DRILLING METHOD: Rotary open hole-water flush | ANGLE: Vertical |

| Drilling & Casing Progress | Core Recovery % | | | STRATA DESCRIPTION | Legend | Depth (m) | Reduced Level (m) |
|----------------------------|-----------------|---|---|--|---|-----------|-------------------|
| | T | S | R | | | | |
| P.W. casing to 6.0m | | | | Made ground (PIT FILL). |  | GL | |
| | | | | Brown CLAY (Weathered PENNINE MIDDLE COAL MEASURES FORMATION). |  | 5.00 | |
| | | | | Brown MUDSTONE with sandstone bands (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 6.20 | |
| | | | | Brown SANDSTONE (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 6.70 | |
| | | | | Brownish-grey MUDSTONE with sandstone bands. (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 7.80 | |
| | | | | Grey MUDSTONE with sandstone bands. (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 13.00 | |
| | | | | Grey SANDSTONE (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 15.30 | |
| | | | | Grey MUDSTONE with sandstone bands. (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 18.50 | |
| | | | | Grey SANDSTONE. (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 28.30 | |
| | | | | Grey MUDSTONE with sandstone bands. (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 31.50 | |
| | | | COAL (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 38.80 | | |
| | | | Borehole continued/ | | 40.00 | | |

| | | | |
|-----------------|--|---|---------|
| REMARKS: | 80% loss of flush returns below 43.0 m | T = total core recovery | FIG NO. |
| | 100% loss of flush returns below 44.1 m. | S = solid core recovery R = rock quality designation | |

GROUND INVESTIGATION SPECIALISTS LIMITED





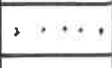
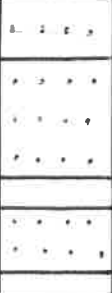



| | | |
|--|--|------------------------|
| CONTRACT: Narrowboat Way, Brierley Hill | | BOREHOLE No. R2 |
| CLIENT: CBRE Limited | | SHEET 2 OF 2 |
| ENGINEER: | | JOB No. 1888 |
| DATES DRILLED: 20.08.18 | RIG TYPE: Hands England | DRILLER: MT |
| GROUND LEVEL: | DRILLING METHOD: Rotary open hole-water flush | ANGLE: Vertical |

| Drilling & Casing Progress | Core Recovery % | | | STRATA DESCRIPTION | Legend | Depth (m) | Reduced Level (m) |
|----------------------------|-----------------|---|---|--|--------|-----------|-------------------|
| | T | S | R | | | | |
| | | | | Borehole continued .../ | | 40.00 | |
| | | | | COAL. (PENNINE MIDDLE COAL MEASURES FORMATION) | | 43.00 | |
| | | | | Weak drilling – 80% loss of flush returns. | | 44.10 | |
| | | | | Broken ground – 100% loss of flush returns. | | 47.30 | |
| | | | | Firm drilling. | | 50.00 | |
| | | | | Borehole Complete. | | | |

| | | | |
|-----------------|---|---|---------|
| REMARKS: | 80% loss of flush returns below 43.0 m | T = total core recovery | FIG NO. |
| | 100% loss of flush returns below 44.1 m | S = solid core recovery R = rock quality designation | |

GROUND INVESTIGATION SPECIALISTS LIMITED

| | | |
|--|--|------------------------|
| CONTRACT: Narrowboat Way, Brierley Hill | | BOREHOLE No. R3 |
| CLIENT: CBRE Limited | | SHEET 1 OF 2 |
| ENGINEER: | | JOB No. 1888 |
| DATES DRILLED: 20-21.08.18 | RIG TYPE: Hands England | DRILLER: MT |
| GROUND LEVEL: | DRILLING METHOD: Rotary open hole-water flush | ANGLE: Vertical |

| Drilling & Casing Progress | Core Recovery % | | | STRATA DESCRIPTION | Legend | Depth (m) | Reduced Level (m) |
|----------------------------|-----------------|---|---|--|---|-----------|-------------------|
| | T | S | R | | | | |
| P.W. casing to 7.0m | | | | Made ground (PIT FILL with concrete and burnt shale fragments). |  | 5.30 | |
| | | | | Brown CLAY (Weathered PENNINE MIDDLE COAL MEASURES FORMATION). |  | 6.50 | |
| | | | | Brown MUDSTONE (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 7.50 | |
| | | | | Brown SANDSTONE (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 9.70 | |
| | | | | Greyish-brown MUDSTONE with sandstone bands. (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 13.20 | |
| | | | | Grey SANDSTONE with mudstone bands. (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 22.50 | |
| | | | | Grey MUDSTONE with sandstone bands. (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 37.00 | |
| | | | | Weak MUDSTONE – 70% loss of flush returns. (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 39.00 | |
| | | | | Firm MUDSTONE (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 40.00 | |

| | | |
|--|--|----------------|
| REMARKS: 70% loss of flush returns below 3.70 m. 100% loss of flush returns below 44.3 m. | T = total core recovery S = solid core recovery R = rock quality designation | FIG NO. |
|--|--|----------------|

GROUND INVESTIGATION SPECIALISTS LIMITED

| | | |
|--|--|------------------------|
| CONTRACT: Narrowboat Way, Brierley Hill | | BOREHOLE No. R3 |
| CLIENT: CBRE Limited | | SHEET 2 OF 2 |
| ENGINEER: | | JOB No. 1888 |
| DATES DRILLED: 20-21.08.18 | RIG TYPE: Hands England | DRILLER: MT |
| GROUND LEVEL: | DRILLING METHOD: Rotary open hole-water flush | ANGLE: Vertical |

| Drilling & Casing Progress | Core Recovery % | | | STRATA DESCRIPTION | Legend | Depth (m) | Reduced Level (m) |
|----------------------------|-----------------|---|---|---|--------|-----------|-------------------|
| | T | S | R | | | | |
| | | | | Borehole continued .../ | | 40.00 | |
| | | | | Firm MUDSTONE (PENNINE MIDDLE COAL MEASURES FORMATION). | | 40.50 | |
| | | | | Firm COAL. (PENNINE MIDDLE COAL MEASURES FORMATION). | | 44.30 | |
| | | | | Broken ground – 100% loss of flush returns. | | 46.50 | |
| | | | | Firm drilling. | | 50.00 | |
| | | | | Borehole Complete. | | | |

| | | | |
|-----------------|---|--|----------------|
| REMARKS: | 70% loss of flush returns below 3.70 m | T = total core recovery S = solid core recovery R = rock quality designation | FIG NO. |
| | 100% loss of flush returns below 44.3 m | | |

GROUND INVESTIGATION SPECIALISTS LIMITED






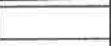






| | | |
|--|--|------------------------|
| CONTRACT: Narrowboat Way, Brierley Hill | | BOREHOLE No. R4 |
| CLIENT: CBRE Limited | | SHEET 1 OF 1 |
| ENGINEER: | | JOB No. 1888 |
| DATES DRILLED: 22-23.08.18 | RIG TYPE: Hands England | DRILLER: MT |
| GROUND LEVEL: | DRILLING METHOD: Rotary open hole-water flush | ANGLE: Vertical |

| Drilling & Casing Progress | Core Recovery % | | | STRATA DESCRIPTION | Legend | Depth (m) | Reduced Level (m) |
|----------------------------|-----------------|---|---|--|--------|------------|-------------------|
| | T | S | R | | | | |
| | | | | Made ground (foundry SAND and slag boulders). | XXXX | GL 1.50 | |
| | | | | Borehole refused on suspected slag boulders. Attempted unsuccessfully in three additional locations. | | | |

| | | |
|-----------------|---|----------------|
| REMARKS: | T = total core recovery S = solid core recovery R = rock quality designation | FIG NO. |
|-----------------|---|----------------|

GROUND INVESTIGATION SPECIALISTS LIMITED

| | | |
|--|--|------------------------|
| CONTRACT: Narrowboat Way, Brierley Hill | | BOREHOLE No. R5 |
| CLIENT: CBRE Limited | | SHEET 1 OF 2 |
| ENGINEER: | | JOB No. 1888 |
| DATES DRILLED: 22.08.18 | RIG TYPE: Hands England | DRILLER: MT |
| GROUND LEVEL: | DRILLING METHOD: Rotary open hole-water flush | ANGLE: Vertical |

| Drilling & Casing Progress | Core Recovery % | | | STRATA DESCRIPTION | Legend | Depth (m) | Reduced Level (m) |
|----------------------------|-----------------|---|---|---|---|-----------|-------------------|
| | T | S | R | | | | |
| P.W. casing to 7.0m | | | | Made ground (PIT FILL with slag and concrete fragments). |  | GL | |
| | | | | Brown CLAY (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 5.50 | |
| | | | | Brown MUDSTONE (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 6.70 | |
| | | | | Brownish-grey MUDSTONE (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 8.50 | |
| | | | | Grey MUDSTONE. (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 10.00 | |
| | | | | Grey SANDSTONE with mudstone bands. (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 13.10 | |
| | | | | Grey MUDSTONE with sandstone bands. (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 21.80 | |
| | | | | Grey SANDSTONE. (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 26.50 | |
| | | | | Grey MUDSTONE with sandstone bands. (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 29.80 | |
| | | | | Grey SANDSTONE. (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 38.30 | |
| | | | Weak drilling – 80% loss of flush returns. |  | 39.80 | | |
| | | | Weak COAL (PENNINE MIDDLE COAL MEASURES FORMATION). |  | 40.00 | | |
| | | | Borehole continued .../ | | | | |

| | | |
|--|--|----------------|
| REMARKS: 80% loss of flush returns below 38.3 m 100% loss of flush returns below 42.5 m | T = total core recovery S = solid core recovery R = rock quality designation | FIG NO. |
|--|--|----------------|

GROUND INVESTIGATION SPECIALISTS LIMITED

| | | |
|--|--|------------------------|
| CONTRACT: Narrowboat Way, Brierley Hill | | BOREHOLE No. R5 |
| CLIENT: CBRE Limited | | SHEET 2 OF 2 |
| ENGINEER: | | JOB No. 1888 |
| DATES DRILLED: 21.08.18 | RIG TYPE: Hands England | DRILLER: MT |
| GROUND LEVEL: | DRILLING METHOD: Rotary open hole-water flush | ANGLE: Vertical |

| Drilling & Casing Progress | Core Recovery % | | | STRATA DESCRIPTION | Legend | Depth (m) | Reduced Level (m) |
|----------------------------|-----------------|---|---|--|--------|-----------|-------------------|
| | T | S | R | | | | |
| | | | | | | 40.00 | |
| | | | | Weak COAL. (PENNINE MIDDLE COAL MEASURES FORMATION) | | 42.50 | |
| | | | | Slightly broken ground – 100% loss of flush returns. | | 45.20 | |
| | | | | Broken ground. | | 47.80 | |
| | | | | Firm drilling. | | 50.00 | |
| | | | | Borehole Complete. Standpipe installed to 4.0 m (1.0 m plain pipe onto 3.0 m slotted pipe). | | | |

| | | |
|---|---|----------------|
| REMARKS: | T = total core recovery S = solid core recovery R = rock quality designation | FIG NO. |
| 80% loss of flush returns below 38.3 m 100% loss of flush returns below 42.5 m | | |

8.0 GROUND GAS AND GROUNDWATER MONITORING TEST RESULTS

GROUND INVESTIGATION SPECIALISTS LIMITED

| | |
|--|---------------------|
| CONTRACT: Narrowboat Way, Brierley Hill | SHEET 1 OF 1 |
| CLIENT: CBRE Limited | JOB No. 1888 |
| ENGINEER: | |

| | | | | |
|----------------------|--------------------|-----------------------|--------------------------------------|------------------------|
| DATE: 24.8.18 | TIME: 14:30 | AIR TEMP: 20°C | BAROMETRIC PRESSURE: 995 mbar | TECHNICIAN: CSN |
|----------------------|--------------------|-----------------------|--------------------------------------|------------------------|

METEOROLOGICAL AND OUTSIDE SITE CONDITIONS

| STATE OF GROUND | Dry | Moist | Wet | Saturated |
|----------------------|------|-----------|----------|-----------|
| WIND | Calm | Light | Moderate | Strong |
| CLOUD COVER | None | Scattered | Broken | Overcast |
| PRECIPITATION | None | Slight | Moderate | Heavy |

| BOREHOLE NO: | METHANE (% v/v) | CARBON DIOXIDE (% V/V) | OXYGEN (% v/v) | CARBON MONOXIDE (PPM) | HYDROGEN SULPHIDE (PPM) | FLOW (l/hr) | WATER LEVEL (m) |
|--------------|-----------------|------------------------|----------------|-----------------------|-------------------------|-------------|-----------------|
| WS2 | <0.1 | 16.2 | 0.4 | 0 | 0 | 0 | 4.85 |
| R5 | <0.1 | 9.7 | 5.1 | 10 | 0 | 0 | Dry |

| | |
|-----------------|----------------|
| REMARKS: | FIG No. |
|-----------------|----------------|

GROUND INVESTIGATION SPECIALISTS LIMITED

| | |
|--|---------------------|
| CONTRACT: Narrowboat Way, Brierley Hill | SHEET 1 OF 1 |
| CLIENT: CBRE Limited | JOB No. 1888 |
| ENGINEER: | |

| | | | | |
|----------------------|--------------------|-----------------------|---------------------------------------|------------------------|
| DATE: 10.9.18 | TIME: 16:10 | AIR TEMP: 14°C | BAROMETRIC PRESSURE: 1006 mbar | TECHNICIAN: TJM |
|----------------------|--------------------|-----------------------|---------------------------------------|------------------------|

METEOROLOGICAL AND OUTSIDE SITE CONDITIONS

| STATE OF GROUND | Dry | Moist | Wet | Saturated |
|----------------------|------|-----------|----------|-----------|
| WIND | Calm | Light | Moderate | Strong |
| CLOUD COVER | None | Scattered | Broken | Overcast |
| PRECIPITATION | None | Slight | Moderate | Heavy |

| BOREHOLE NO: | METHANE (% v/v) | CARBON DIOXIDE (% V/V) | OXYGEN (% v/v) | CARBON MONOXIDE (PPM) | HYDROGEN SULPHIDE (PPM) | FLOW (l/hr) | WATER LEVEL (m) |
|--------------|-----------------|------------------------|----------------|-----------------------|-------------------------|-------------|-----------------|
| WS2 | <0.1 | 14.7 | 1.9 | 0 | 0 | 0 | 4.92 |
| R5 | <0.1 | 9.7 | 7.5 | 0 | 0 | 0 | 3.65 |

| | |
|-----------------|----------------|
| REMARKS: | FIG No. |
|-----------------|----------------|

GROUND INVESTIGATION SPECIALISTS LIMITED

| | |
|--|---------------------|
| CONTRACT: Narrowboat Way, Brierley Hill | SHEET 1 OF 1 |
| CLIENT: CBRE Limited | JOB No. 1888 |
| ENGINEER: | |

| | | | | |
|----------------------|-------------------|-----------------------|---------------------------------------|------------------------|
| DATE: 14.9.18 | TIME: 9:30 | AIR TEMP: 12°C | BAROMETRIC PRESSURE: 1004 mbar | TECHNICIAN: CSN |
|----------------------|-------------------|-----------------------|---------------------------------------|------------------------|

METEOROLOGICAL AND OUTSIDE SITE CONDITIONS

| | | | | |
|------------------------|------|-----------|----------|-----------|
| STATE OF GROUND | Dry | Moist | Wet | Saturated |
| WIND | Calm | Light | Moderate | Strong |
| CLOUD COVER | None | Scattered | Broken | Overcast |
| PRECIPITATION | None | Slight | Moderate | Heavy |

| BOREHOLE NO: | METHANE (% v/v) | CARBON DIOXIDE (% V/V) | OXYGEN (% v/v) | CARBON MONOXIDE (PPM) | HYDROGEN SULPHIDE (PPM) | FLOW (l/hr) | WATER LEVEL (m) |
|--------------|-----------------|------------------------|----------------|-----------------------|-------------------------|--------------------------|-----------------|
| WS2 | <0.1 | 15.9 | 0.7 | 0 | 0 | -0.7 (zeroed in 10 s) | 4.93 |
| R5 | <0.1 | 10.5 | 7.1 | 0 | 0 | 0 | Dry |

| | |
|-----------------|----------------|
| REMARKS: | FIG No. |
|-----------------|----------------|

9.0 LABORATORY TEST RESULTS



ANALYTICAL TEST REPORT

Contract no: 73812
Contract name: Narrowboat Way
Client reference: J.1888
Clients name: Ground Investigation Specialists
Clients address: Ashton House
67 Compton Road
Wolverhampton
WV3 9QZ
Samples received: 28 August 2018
Analysis started: 28 August 2018
Analysis completed: 03 September 2018
Report issued: 03 September 2018

Notes: Opinions and Interpretations expressed herein are outside the UKAS accreditation scope. Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling. Methods, procedures and performance data are available on request. Results reported herein relate only to the material supplied to the laboratory. This report shall not be reproduced except in full, without prior written approval. Samples will be disposed of 6 weeks from initial receipt unless otherwise instructed.

Key: U UKAS accredited test
M MCERTS & UKAS accredited test
\$ Test carried out by an approved subcontractor
I/S Insufficient sample to carry out test
N/S Sample not suitable for testing
NAD No Asbestos Detected

Approved by:

Dave Bowerbank
Customer Services Co-ordinator

Chemtech Environmental Limited

SAMPLE INFORMATION

MCERTS (Soils):

Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions. MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample. Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

All results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.
Analytical results are inclusive of stones.

| Lab ref | Sample id | Depth (m) | Sample description | Material removed | % Removed | % Moisture |
|---------|-----------|-----------|------------------------------------|------------------|-----------|------------|
| 73812-1 | WS1 | 0.30 | Sand with Gravel & Coal | - | - | 15.5 |
| 73812-2 | WS1 | 2.50 | Clayey Sand with Gravel & Concrete | - | - | 13.9 |
| 73812-3 | WS2 | 0.20 | Clayey Sand with Gravel | - | - | 12.6 |
| 73812-4 | WS2 | 5.80 | Sandy Clay with Gravel | - | - | 11.9 |
| 73812-5 | WS3 | 0.40 | Clayey Sand with Gravel | - | - | 9.0 |
| 73812-6 | WS3 | 2.70 | Sandy Clay with Gravel | - | - | 13.0 |
| 73812-7 | WS4 | 0.30 | Clayey Sand with Gravel | - | - | 6.9 |
| 73812-8 | WS5 | 0.50 | Clayey Sand with Gravel | - | - | 6.7 |

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SOILS

| Lab number | | | 73812-1 | 73812-2 | 73812-3 | 73812-4 | 73812-5 | 73812-6 |
|---------------------------------------|--------------------|----------------------|------------|------------|------------|------------|------------|------------|
| Sample id | | | WS1 | WS1 | WS2 | WS2 | WS3 | WS3 |
| Depth (m) | | | 0.30 | 2.50 | 0.20 | 5.80 | 0.40 | 2.70 |
| Date sampled | | | 17/08/2018 | 17/08/2018 | 17/08/2018 | 17/08/2018 | 17/08/2018 | 17/08/2018 |
| Test | Method | Units | | | | | | |
| Antimony (total) | CE127 ^U | mg/kg Sb | - | - | - | - | 0.9 | - |
| Arsenic (total) | CE127 ^M | mg/kg As | 8.4 | - | 9.4 | - | 8.2 | - |
| Barium (total) | CE127 ^M | mg/kg Ba | - | - | - | - | 101 | - |
| Cadmium (total) | CE127 ^M | mg/kg Cd | 0.3 | - | 0.5 | - | 0.5 | - |
| Chromium (total) | CE127 ^M | mg/kg Cr | 68 | - | 36 | - | 47 | - |
| Copper (total) | CE127 ^M | mg/kg Cu | 142 | - | 88 | - | 36 | - |
| Lead (total) | CE127 ^M | mg/kg Pb | 39 | - | 63 | - | 36 | - |
| Mercury (total) | CE127 ^M | mg/kg Hg | <0.5 | - | <0.5 | - | <0.5 | - |
| Molybdenum (total) | CE127 ^M | mg/kg Mo | - | - | - | - | 2.4 | - |
| Nickel (total) | CE127 ^M | mg/kg Ni | 35 | - | 28 | - | 32 | - |
| Selenium (total) | CE127 ^M | mg/kg Se | 0.7 | - | 1.5 | - | 0.9 | - |
| Zinc (total) | CE127 ^M | mg/kg Zn | 187 | - | 174 | - | 176 | - |
| pH | CE004 ^M | units | 7.4 | 7.2 | 7.5 | 7.7 | 7.9 | 6.1 |
| Sulphate (2:1 water soluble) | CE061 ^M | mg/l SO ₄ | - | 62 | - | 140 | - | 88 |
| Total Organic Carbon (TOC) | CE072 ^M | % w/w C | 8.68 | - | 4.78 | - | 3.39 | - |
| Estimate of OMC (calculated from TOC) | CE072 ^M | % w/w | 14.97 | - | 8.24 | - | 5.84 | - |
| PAH | | | | | | | | |
| Naphthalene | CE087 ^M | mg/kg | 0.99 | - | 0.05 | - | 0.01 | - |
| Acenaphthylene | CE087 ^M | mg/kg | <0.01 | - | 0.05 | - | 0.02 | - |
| Acenaphthene | CE087 ^M | mg/kg | 0.04 | - | 0.03 | - | <0.01 | - |
| Fluorene | CE087 ^U | mg/kg | 0.01 | - | 0.04 | - | 0.01 | - |
| Phenanthrene | CE087 ^M | mg/kg | 0.53 | - | 0.93 | - | 0.13 | - |
| Anthracene | CE087 ^U | mg/kg | <0.02 | - | 0.15 | - | 0.03 | - |
| Fluoranthene | CE087 ^M | mg/kg | 0.13 | - | 0.84 | - | 0.26 | - |
| Pyrene | CE087 ^M | mg/kg | 0.11 | - | 0.68 | - | 0.21 | - |
| Benzo(a)anthracene | CE087 ^U | mg/kg | 0.04 | - | 0.33 | - | 0.14 | - |
| Chrysene | CE087 ^M | mg/kg | 0.10 | - | 0.43 | - | 0.14 | - |
| Benzo(b)fluoranthene | CE087 ^M | mg/kg | 0.07 | - | 0.40 | - | 0.18 | - |
| Benzo(k)fluoranthene | CE087 ^M | mg/kg | <0.02 | - | 0.16 | - | 0.07 | - |
| Benzo(a)pyrene | CE087 ^U | mg/kg | 0.02 | - | 0.25 | - | 0.11 | - |
| Indeno(123cd)pyrene | CE087 ^M | mg/kg | <0.02 | - | 0.19 | - | 0.09 | - |
| Dibenz(ah)anthracene | CE087 ^M | mg/kg | <0.02 | - | 0.04 | - | <0.02 | - |
| Benzo(ghi)perylene | CE087 ^M | mg/kg | 0.05 | - | 0.20 | - | 0.10 | - |
| PAH (total of USEPA 16) | CE087 | mg/kg | 2.08 | - | 4.79 | - | 1.50 | - |
| TPH | | | | | | | | |
| VPH (>C8-C10) | CE067 | mg/kg | <0.1 | - | <0.1 | - | <0.1 | - |
| EPH (>C10-C12) | CE033 ^M | mg/kg | 9 | - | <4 | - | <4 | - |
| EPH (>C12-C16) | CE033 ^M | mg/kg | 60 | - | 15 | - | 6 | - |
| EPH (>C16-C21) | CE033 ^M | mg/kg | 146 | - | 50 | - | 17 | - |
| EPH (>C21-C35) | CE033 ^M | mg/kg | 216 | - | 139 | - | 119 | - |

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SOILS

| | | | | | | | | |
|-------------------------------|---------------|--------------|------------|------------|------------|------------|------------|------------|
| Lab number | | | 73812-1 | 73812-2 | 73812-3 | 73812-4 | 73812-5 | 73812-6 |
| Sample Id | | | WS1 | WS1 | WS2 | WS2 | WS3 | WS3 |
| Depth (m) | | | 0.30 | 2.50 | 0.20 | 5.80 | 0.40 | 2.70 |
| Date sampled | | | 17/08/2018 | 17/08/2018 | 17/08/2018 | 17/08/2018 | 17/08/2018 | 17/08/2018 |
| Test | Method | Units | | | | | | |
| Subcontracted analysis | | | | | | | | |
| Asbestos (qualitative) | \$ | - | NAD | - | NAD | - | NAD | - |

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SOILS

| Lab number | | | 73812-7 | 73812-8 |
|---------------------------------------|--------------------|----------------------|------------|------------|
| Sample id | | | WS4 | WS5 |
| Depth (m) | | | 0.30 | 0.50 |
| Date sampled | | | 17/08/2018 | 17/08/2018 |
| Test | Method | Units | | |
| Antimony (total) | CE127 ^U | mg/kg Sb | - | - |
| Arsenic (total) | CE127 ^M | mg/kg As | 7.0 | 8.0 |
| Barium (total) | CE127 ^M | mg/kg Ba | - | - |
| Cadmium (total) | CE127 ^M | mg/kg Cd | 0.7 | 0.9 |
| Chromium (total) | CE127 ^M | mg/kg Cr | 1084 | 367 |
| Copper (total) | CE127 ^M | mg/kg Cu | 70 | 54 |
| Lead (total) | CE127 ^M | mg/kg Pb | 164 | 67 |
| Mercury (total) | CE127 ^M | mg/kg Hg | <0.5 | <0.5 |
| Molybdenum (total) | CE127 ^M | mg/kg Mo | - | - |
| Nickel (total) | CE127 ^M | mg/kg Ni | 36 | 34 |
| Selenium (total) | CE127 ^M | mg/kg Se | 1.7 | 0.8 |
| Zinc (total) | CE127 ^M | mg/kg Zn | 215 | 209 |
| pH | CE004 ^M | units | 8.5 | 8.3 |
| Sulphate (2:1 water soluble) | CE061 ^M | mg/l SO ₄ | 177 | 204 |
| Total Organic Carbon (TOC) | CE072 ^M | % w/w C | 1.93 | 1.13 |
| Estimate of OMC (calculated from TOC) | CE072 ^M | % w/w | 3.33 | 1.95 |
| PAH | | | | |
| Naphthalene | CE087 ^M | mg/kg | 0.03 | 0.03 |
| Acenaphthylene | CE087 ^M | mg/kg | 0.05 | 0.07 |
| Acenaphthene | CE087 ^M | mg/kg | 0.05 | 0.05 |
| Fluorene | CE087 ^U | mg/kg | 0.03 | 0.03 |
| Phenanthrene | CE087 ^M | mg/kg | 0.46 | 0.38 |
| Anthracene | CE087 ^U | mg/kg | 0.15 | 0.14 |
| Fluoranthene | CE087 ^M | mg/kg | 1.08 | 1.53 |
| Pyrene | CE087 ^M | mg/kg | 1.00 | 1.36 |
| Benzo(a)anthracene | CE087 ^U | mg/kg | 0.63 | 0.62 |
| Chrysene | CE087 ^M | mg/kg | 0.72 | 0.72 |
| Benzo(b)fluoranthene | CE087 ^M | mg/kg | 1.08 | 1.23 |
| Benzo(k)fluoranthene | CE087 ^M | mg/kg | 0.42 | 0.47 |
| Benzo(a)pyrene | CE087 ^U | mg/kg | 0.76 | 0.80 |
| Indeno(123cd)pyrene | CE087 ^M | mg/kg | 0.67 | 0.83 |
| Dibenz(ah)anthracene | CE087 ^M | mg/kg | 0.11 | 0.18 |
| Benzo(ghi)perylene | CE087 ^M | mg/kg | 0.73 | 0.92 |
| PAH (total of USEPA 16) | CE087 | mg/kg | 7.97 | 9.35 |
| TPH | | | | |
| VPH (>C8-C10) | CE067 | mg/kg | <0.1 | <0.1 |
| EPH (>C10-C12) | CE033 ^M | mg/kg | <4 | <4 |
| EPH (>C12-C16) | CE033 ^M | mg/kg | 10 | 13 |
| EPH (>C16-C21) | CE033 ^M | mg/kg | 47 | 60 |
| EPH (>C21-C35) | CE033 ^M | mg/kg | 365 | 823 |

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SOILS

| | | | | |
|-------------------------------|---------------|--------------|------------|------------|
| Lab number | | | 73812-7 | 73812-8 |
| Sample Id | | | WS4 | WS5 |
| Depth (m) | | | 0.30 | 0.50 |
| Date sampled | | | 17/08/2018 | 17/08/2018 |
| Test | Method | Units | | |
| Subcontracted analysis | | | | |
| Asbestos (qualitative) | \$ | - | NAD | NAD |

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METHOD DETAILS

| METHOD | SOILS | METHOD SUMMARY | SAMPLE | STATUS | LOD | UNITS |
|--------|---------------------------------------|---|--------|--------|------|----------------------|
| CE127 | Antimony (total) | Aqua regia digest, ICP-MS | Dry | U | 0.2 | mg/kg Sb |
| CE127 | Arsenic (total) | Aqua regia digest, ICP-MS | Dry | M | 1 | mg/kg As |
| CE127 | Barium (total) | Aqua regia digest, ICP-MS | Dry | M | 1 | mg/kg Ba |
| CE127 | Cadmium (total) | Aqua regia digest, ICP-MS | Dry | M | 0.2 | mg/kg Cd |
| CE127 | Chromium (total) | Aqua regia digest, ICP-MS | Dry | M | 1 | mg/kg Cr |
| CE127 | Copper (total) | Aqua regia digest, ICP-MS | Dry | M | 1 | mg/kg Cu |
| CE127 | Lead (total) | Aqua regia digest, ICP-MS | Dry | M | 1 | mg/kg Pb |
| CE127 | Mercury (total) | Aqua regia digest, ICP-MS | Dry | M | 0.5 | mg/kg Hg |
| CE127 | Molybdenum (total) | Aqua regia digest, ICP-MS | Dry | M | 1 | mg/kg Mo |
| CE127 | Nickel (total) | Aqua regia digest, ICP-MS | Dry | M | 1 | mg/kg Ni |
| CE127 | Selenium (total) | Aqua regia digest, ICP-MS | Dry | M | 0.3 | mg/kg Se |
| CE127 | Zinc (total) | Aqua regia digest, ICP-MS | Dry | M | 5 | mg/kg Zn |
| CE004 | pH | Based on BS 1377, pH Meter | Wet | M | - | units |
| CE061 | Sulphate (2:1 water soluble) | Aqueous extraction, ICP-OES | Dry | M | 10 | mg/l SO ₄ |
| CE072 | Total Organic Carbon (TOC) | Removal of IC by acidification, Carbon Analyser | Dry | M | 0.1 | % w/w C |
| CE072 | Estimate of OMC (calculated from TOC) | Calculation from Total Organic Carbon | Dry | M | 0.1 | % w/w |
| CE087 | Naphthalene | Solvent extraction, GC-MS | Wet | M | 0.01 | mg/kg |
| CE087 | Acenaphthylene | Solvent extraction, GC-MS | Wet | M | 0.01 | mg/kg |
| CE087 | Acenaphthene | Solvent extraction, GC-MS | Wet | M | 0.01 | mg/kg |
| CE087 | Fluorene | Solvent extraction, GC-MS | Wet | U | 0.01 | mg/kg |
| CE087 | Phenanthrene | Solvent extraction, GC-MS | Wet | M | 0.02 | mg/kg |
| CE087 | Anthracene | Solvent extraction, GC-MS | Wet | U | 0.02 | mg/kg |
| CE087 | Fluoranthene | Solvent extraction, GC-MS | Wet | M | 0.02 | mg/kg |
| CE087 | Pyrene | Solvent extraction, GC-MS | Wet | M | 0.02 | mg/kg |
| CE087 | Benzo(a)anthracene | Solvent extraction, GC-MS | Wet | U | 0.02 | mg/kg |
| CE087 | Chrysene | Solvent extraction, GC-MS | Wet | M | 0.01 | mg/kg |
| CE087 | Benzo(b)fluoranthene | Solvent extraction, GC-MS | Wet | M | 0.02 | mg/kg |
| CE087 | Benzo(k)fluoranthene | Solvent extraction, GC-MS | Wet | M | 0.02 | mg/kg |
| CE087 | Benzo(a)pyrene | Solvent extraction, GC-MS | Wet | U | 0.02 | mg/kg |
| CE087 | Indeno(123cd)pyrene | Solvent extraction, GC-MS | Wet | M | 0.02 | mg/kg |
| CE087 | Dibenz(ah)anthracene | Solvent extraction, GC-MS | Wet | M | 0.02 | mg/kg |
| CE087 | Benzo(ghi)perylene | Solvent extraction, GC-MS | Wet | M | 0.02 | mg/kg |
| CE087 | PAH (total of USEPA 16) | Solvent extraction, GC-MS | Wet | | 0.27 | mg/kg |
| CE067 | VPH (>C8-C10) | Headspace GC-FID | Wet | | 0.1 | mg/kg |
| CE033 | EPH (>C10-C12) | Solvent extraction, GC-FID | Wet | M | 4 | mg/kg |
| CE033 | EPH (>C12-C16) | Solvent extraction, GC-FID | Wet | M | 4 | mg/kg |
| CE033 | EPH (>C16-C21) | Solvent extraction, GC-FID | Wet | M | 4 | mg/kg |
| CE033 | EPH (>C21-C35) | Solvent extraction, GC-FID | Wet | M | 6 | mg/kg |
| \$ | Asbestos (qualitative) | HSG 248, Microscopy | Dry | U | - | - |

**Waste Acceptance Criteria Testing
BS EN 12457-Part 3, 2 Stage Process**



Sample Details

Contract Name Narrowboat Way
Lab Number 73812-5
Sample ID WS3 0.40m
Date Sampled 17 August 2018
Date Received 28 August 2018
Particle Size (<4mm) -
Method of size reduction N/A
Non-crushable matter N/A

Test Values

Mass of Raw Test Portion (MW) kg 0.192
Mass of Dried Test Portion (MD) kg 0.175
Moisture Content Ratio (MC) % 9.71
Dry Matter Content Ratio (DR) % 91.15
Leachant Volume (1) (L2) Litre 0.333
Leachant Volume (2) (L8) Litre 1.400
Eluate Volume (1) (VE1) Litre 0.260
Eluate Volume (2) (VE2) Litre 1.300

| Eluate Analysis | Conc in Eluate | |
|-----------------------------------|----------------|--------|
| | 2:1 | 8:1 |
| Liquid : Waste Ratio | 2:1 | 8:1 |
| pH (units) | 8.0 | 7.0 |
| Temperature (°C) | 20 | 20 |
| Conductivity (µS/cm) | 248 | 92 |
| Antimony (µg/l Sb) | 1.3 | 0.4 |
| Arsenic (µg/l As) | 0.88 | 1.28 |
| Barium (µg/l Ba) | 20.3 | 11.4 |
| Cadmium (µg/l Cd) | <0.07 | <0.07 |
| Chromium (µg/l Cr) | <0.2 | <0.2 |
| Copper (µg/l Cu) | 5.3 | 4.2 |
| Lead (µg/l Pb) | 1.0 | 0.3 |
| Mercury (µg/l Hg) | 0.016 | <0.008 |
| Molybdenum (µg/l Mo) | 9.3 | 5.7 |
| Nickel (µg/l Ni) | 0.6 | <0.5 |
| Selenium (µg/l Se) | 0.61 | 0.61 |
| Zinc (µg/l Zn) | 4 | <1 |
| Chloride (mg/l Cl) | 2.8 | 1.0 |
| Fluoride (mg/l F) | 2.2 | 1.7 |
| Sulphate (mg/l SO ₄) | 12 | <10 |
| Total Dissolved Solids (mg/l TDS) | 190 | 70 |
| Phenol Index (µg/l PhOH) | <10 | <10 |
| Dissolved Organic Carbon (mg/l C) | 6.1 | <5 |

| Amount Leached | | BS EN 12457-3 Limit Values mg/kg at L:S 10:1 | | |
|----------------|--------------------|---|------------------------------------|--------------------|
| 2:1 mg/kg | 10:1 mg/kg | Inert Waste | Non-reactive Hazardous Waste | Hazardous Waste |
| 0.003 | 0.006 | 0.06 | 0.7 | 5 |
| 0.002 | 0.012 | 0.5 | 2 | 25 |
| 0.041 | 0.127 | 20 | 100 | 300 |
| <0.0002 | <0.0007 | 0.04 | 1 | 5 |
| <0.0004 | <0.002 | 0.5 | 10 | 70 |
| 0.011 | 0.044 | 2 | 50 | 100 |
| 0.002 | 0.004 | 0.5 | 10 | 50 |
| 0.00003 | <0.00010 | 0.01 | 0.2 | 2 |
| 0.019 | 0.062 | 0.5 | 10 | 30 |
| 0.001 | <0.006 | 0.4 | 10 | 40 |
| 0.001 | 0.006 | 0.1 | 0.5 | 7 |
| 0.008 | <0.015 | 4 | 50 | 200 |
| 5.7 | 13 | 800 | 15000 | 25000 |
| 4.3 | 18 | 10 | 150 | 500 |
| 23 | <103 | 1000 | 20000 | 50000 |
| 380 | 878 | 4000 | 60000 | 100000 |
| <0.02 | <0.1 | 1 | | |
| 12 | <52 | 500 | 800 | 1000 |

| Waste Analysis | |
|------------------------------------|--|
| Total Organic Carbon | |
| Loss on Ignition | |
| BTEX | |
| PCBs (7 congeners) | |
| TPH (C10 - C40) | |
| PAH (total) | |
| pH | |
| Acid Neutralisation Capacity (pH4) | |
| Acid Neutralisation Capacity (pH7) | |

| Units | Result | | | |
|----------|------------------|-----|-----------------|-----|
| % w/w | 3.4 | 3% | 5% | 6% |
| % w/w | 12.0 | | | 10% |
| mg/kg | <0.06 | 6 | | |
| mg/kg | <0.045 | 1 | | |
| mg/kg | 188 | 500 | | |
| mg/kg | 1.50 | 100 | | |
| pH units | 7.9 | | >6 | |
| mol/kg | 0.16 | | To be evaluated | |
| mol/kg | 0.04 | | To be evaluated | |

Disclaimer : The Landfill Waste Acceptance Criteria limits in this report are provided for guidance only. Chemtech Environmental Ltd does not take responsibility for any errors or omissions. Data is correct as of 01/09/2005. Samples will be disposed of 6 weeks from initial receipt unless written instructions are received and further storage is agreed. Waste Acceptance Criteria testing is outside the scope of the laboratory's UKAS accreditation.

Comments

Authorised by: *J. Campbell* Name: John Campbell
Report date: 3 September 2018 Position: Director

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Vat Reg No. 772 5703 18 Registered in England number 4284013

10.0 WASTE CLASSIFICATION REPORT



Waste Classification Report



DNF2D-HD5WF-49UJG

Job name

Narrowboat Way

Description/Comments

Project

Site

Waste Stream Template

General Soil Default Waste Stream

Classified by

Name: Tom McLaren
Date: 13 Sep 2018 14:06 GMT
Telephone: 01902 717653

Company: Ground Investigation Specialists
Ashton House
67 Compton Road
Wolverhampton
WV3 9QZ

Report

Created by: Tom McLaren
Created date: 13 Sep 2018 14:06 GMT

Job summary

| # | Sample Name | Depth [m] | Classification Result | Hazard properties | Page |
|---|-------------|-------------|-----------------------|-------------------|------|
| 1 | MG Max | 0.20 - 0.50 | Non Hazardous | | 2 |

Appendices

| Appendix | Page |
|---|------|
| Appendix A: Classifier defined and non CLP determinands | 5 |
| Appendix B: Rationale for selection of metal species | 6 |
| Appendix C: Version | 7 |



Classification of sample: MG Max

☑ **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

| | | |
|-------------------------|-----------|--|
| Sample Name: | LoW Code: | |
| MG Max | Chapter: | 17: Construction and Demolition Wastes (including excavated soil from contaminated sites) |
| Sample Depth: | Entry: | 17 05 04 (Soil and stones other than those mentioned in 17 05 03) |
| 0.20 - 0.50 m | | |
| Moisture content: | | |
| 9.7% | | |
| (dry weight correction) | | |

Hazard properties

None identified

Determinands

Moisture content: 9.7% Dry Weight Moisture Correction applied (MC)

| # | Determinand | | | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|----|---|-----------|------------|----------|-------------------|-------|--------------|----------------|-------|----------------------|------------|----------------|
| | CLP index number | EC Number | CAS Number | | | | | | | | | |
| 1 | arsenic { arsenic compounds, with the exception of those specified elsewhere in this Annex } 033-002-00-5 | | | 1 | 9.4 | mg/kg | | 8.569 | mg/kg | 0.000857 % | ✓ | |
| 2 | cadmium { cadmium sulfide } 048-010-00-4 215-147-8 1306-23-6 | | | 1 | 0.9 | mg/kg | 1.285 | 1.054 | mg/kg | 0.000082 % | ✓ | |
| 3 | chromium(III) oxide 215-160-9 1308-38-9 | | | | 1084 | mg/kg | | 988.149 | mg/kg | 0.0988 % | ✓ | |
| 4 | copper { dicopper oxide; copper (I) oxide } 029-002-00-X 215-270-7 1317-39-1 | | | | 142 | mg/kg | 1.126 | 145.739 | mg/kg | 0.0146 % | ✓ | |
| 5 | lead { lead compounds with the exception of those specified elsewhere in this Annex } 082-001-00-6 | | | 1 | 164 | mg/kg | | 149.499 | mg/kg | 0.0149 % | ✓ | |
| 6 | mercury { compounds of mercury (with the exception of mercuric sulfide and those listed separately in this Annex) } 080-002-00-6 | | | 1 | <0.5 | mg/kg | 1.39 | <0.695 | mg/kg | <0.00005 % | | <LOD |
| 7 | nickel { nickel dihydroxide } 028-008-00-X 235-008-5 [1] 12054-48-7 [1] 234-348-1 [2] 11113-74-9 [2] | | | | 36 | mg/kg | 1.579 | 51.834 | mg/kg | 0.00518 % | ✓ | |
| 8 | selenium { selenium compounds with the exception of cadmium selenosulfide and those specified elsewhere in this Annex } 034-002-00-8 | | | | 1.7 | mg/kg | 2.554 | 3.957 | mg/kg | 0.000396 % | ✓ | |
| 9 | zinc { zinc oxide } 030-013-00-7 215-222-5 1314-13-2 | | | | 209 | mg/kg | 1.245 | 237.142 | mg/kg | 0.0237 % | ✓ | |
| 10 | pH PH | | | | 7.4 | pH | | 7.4 | pH | 7.4 pH | | |
| 11 | TPH (C6 to C40) petroleum group TPH | | | | 1038.1 | mg/kg | | 946.308 | mg/kg | 0.0946 % | ✓ | |
| 12 | benzene 601-020-00-8 200-753-7 71-43-2 | | | | <0.06 | mg/kg | | <0.06 | mg/kg | <0.000006 % | | <LOD |



| # | Determinand | | | CLP Note | User entered data | Conv. Factor | Compound conc. | Classification value | MC Applied | Conc. Not Used |
|--------|------------------------------------|--|--|----------|-------------------|--------------|----------------|----------------------|------------|----------------|
| | CLP index number | EC Number | CAS Number | | | | | | | |
| 13 | toluene | | | | <0.06 mg/kg | | <0.06 mg/kg | <0.000006 % | | <LOD |
| | 601-021-00-3 | 203-625-9 | 108-88-3 | | | | | | | |
| 14 | ethylbenzene | | | | <0.06 mg/kg | | <0.06 mg/kg | <0.000006 % | | <LOD |
| | 601-023-00-4 | 202-849-4 | 100-41-4 | | | | | | | |
| 15 | xylene | | | | <0.06 mg/kg | | <0.06 mg/kg | <0.000006 % | | <LOD |
| | 601-022-00-9 | 202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4] | 95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4] | | | | | | | |
| 16 | naphthalene | | | | 0.99 mg/kg | | 0.902 mg/kg | 0.0000902 % | ✓ | |
| | 601-052-00-2 | 202-049-5 | 91-20-3 | | | | | | | |
| 17 | acenaphthylene | | | | 0.07 mg/kg | | 0.0638 mg/kg | 0.00000638 % | ✓ | |
| | | 205-917-1 | 208-96-8 | | | | | | | |
| 18 | acenaphthene | | | | 0.05 mg/kg | | 0.0456 mg/kg | 0.00000456 % | ✓ | |
| | | 201-469-6 | 83-32-9 | | | | | | | |
| 19 | fluorene | | | | 0.04 mg/kg | | 0.0365 mg/kg | 0.00000365 % | ✓ | |
| | | 201-695-5 | 86-73-7 | | | | | | | |
| 20 | phenanthrene | | | | 0.93 mg/kg | | 0.848 mg/kg | 0.0000848 % | ✓ | |
| | | 201-581-5 | 85-01-8 | | | | | | | |
| 21 | anthracene | | | | 0.15 mg/kg | | 0.137 mg/kg | 0.0000137 % | ✓ | |
| | | 204-371-1 | 120-12-7 | | | | | | | |
| 22 | fluoranthene | | | | 1.53 mg/kg | | 1.395 mg/kg | 0.000139 % | ✓ | |
| | | 205-912-4 | 206-44-0 | | | | | | | |
| 23 | pyrene | | | | 1.36 mg/kg | | 1.24 mg/kg | 0.000124 % | ✓ | |
| | | 204-927-3 | 129-00-0 | | | | | | | |
| 24 | benzo[a]anthracene | | | | 0.63 mg/kg | | 0.574 mg/kg | 0.0000574 % | ✓ | |
| | 601-033-00-9 | 200-280-6 | 56-55-3 | | | | | | | |
| 25 | chrysene | | | | 0.72 mg/kg | | 0.656 mg/kg | 0.0000656 % | ✓ | |
| | 601-048-00-0 | 205-923-4 | 218-01-9 | | | | | | | |
| 26 | benzo[b]fluoranthene | | | | 1.23 mg/kg | | 1.121 mg/kg | 0.000112 % | ✓ | |
| | 601-034-00-4 | 205-911-9 | 205-99-2 | | | | | | | |
| 27 | benzo[k]fluoranthene | | | | 0.47 mg/kg | | 0.428 mg/kg | 0.0000428 % | ✓ | |
| | 601-036-00-5 | 205-916-6 | 207-08-9 | | | | | | | |
| 28 | benzo[a]pyrene; benzo[def]chrysene | | | | 0.76 mg/kg | | 0.693 mg/kg | 0.0000693 % | ✓ | |
| | 601-032-00-3 | 200-028-5 | 50-32-8 | | | | | | | |
| 29 | indeno[123-cd]pyrene | | | | 0.83 mg/kg | | 0.757 mg/kg | 0.0000757 % | ✓ | |
| | | 205-893-2 | 193-39-5 | | | | | | | |
| 30 | dibenz[a,h]anthracene | | | | 0.18 mg/kg | | 0.164 mg/kg | 0.0000164 % | ✓ | |
| | 601-041-00-2 | 200-181-8 | 53-70-3 | | | | | | | |
| 31 | benzo[ghi]perylene | | | | 0.92 mg/kg | | 0.839 mg/kg | 0.0000839 % | ✓ | |
| | | 205-883-8 | 191-24-2 | | | | | | | |
| 32 | polychlorobiphenyls; PCB | | | | <0.045 mg/kg | | <0.045 mg/kg | <0.0000045 % | | <LOD |
| | 602-039-00-4 | 215-648-1 | 1336-36-3 | | | | | | | |
| Total: | | | | | | | | 0.254 % | | |

Key

- User supplied data
- Determinand values ignored for classification, see column 'Conc. Not Used' for reason
- s Determinand defined or amended by HazWasteOnline (see Appendix A)
- s Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
- <LOD** Below limit of detection
- CLP: Note 1 Only the metal concentration has been used for classification

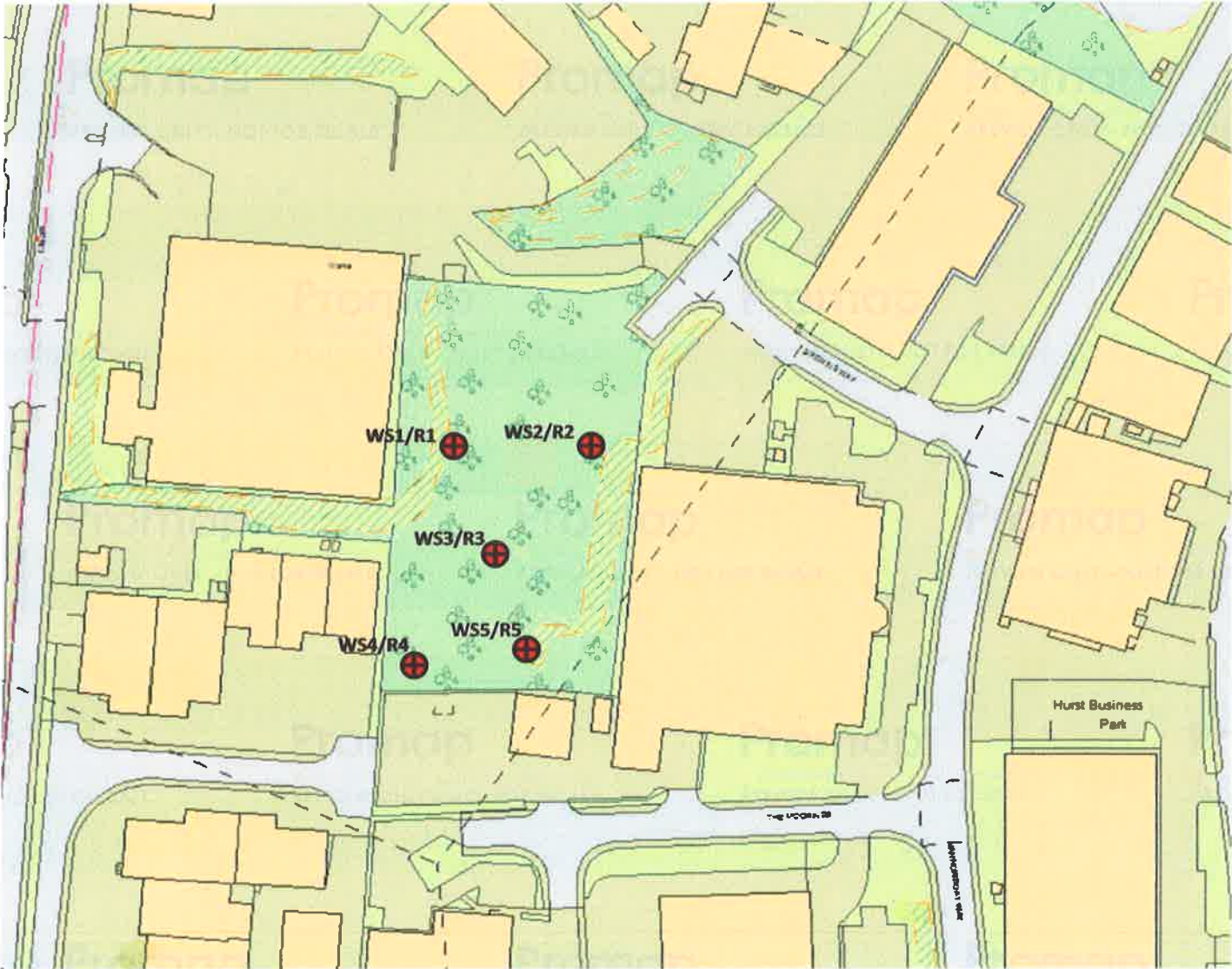
Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because not liquid

11.0 EXISTING SITE PLAN

EXISTING SITE PLAN



KEY

⊕ - Windowless Sampling (WS)/ Rotary (R) Borehole Location