



**BROWNFIELD
SOLUTIONS LTD**

GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

STEWART MILNE HOMES

Halsnead Park, Whiston

Geo-environmental Assessment Report

LC/C3593/7018

July 2017

EXECUTIVE SUMMARY – HALSNEAD PARK	
Location	The site covers an area of approximately 11.5 hectares and is situated approximately 12.6 kilometres east of Liverpool City Centre. The site is centred on National Grid Reference 347218, 390362.
Ground Conditions	The site is split into two parcels of Land referred to as Area A and Area B. Within Area A made ground was encountered to depths of between 0.30m and in excess of 1.50m. The made ground encountered was generally granular and comprising cobbles of brick and concrete within a sandy and or clayey matrix. No evidence of shallow mining issues were found within Area A during the site investigation. However access was limited within this portion of the site due to it being heavily vegetated and additional investigation may be required to further assess the risk from coal mining and to locate the two known mine shafts within this area. Interpretation of the result from Area B indicates that there should be shallow seams, although these have not been encountered. Area B is largely an open field. Made ground was present locally and this is interpreted to be associated with outcrop mining. Bedrock across the remainder of Area B consisted of siltstone and mudstone with coal seams present at shallow depths. The mining investigation identified soft and broken ground proving shallow mining to have been undertaken below the site. A risk at the surface from shallow workings was identified across the main field within Area B.
Foundations and Floor Slabs	Foundation recommendations are preliminary at this stage as no development layout or finished site levels are available. Within Area A foundations are likely to be shallow unreinforced strip foundations founding on natural clays or weathered bedrock between 1.20m and 1.50m. Foundations may need to be deepened locally where trees are present in accordance with NHBC Chapter 4.2 or where deeper pockets of made ground exist. It is considered that this will best be achieved by trench or mass fill foundations. Due to the likelihood of ground gas precautionary measures being required within Area A it is recommended that suspended floor slabs are implemented. Within Area B treatment of mine workings is required to prevent subsidence of foundations. The extents of the treatment areas relating to coal seams is unknown at this stage. Following treatment reinforced strip foundations are considered the most suitable solution for the majority of plots within Area B within clays and weathered bedrock at shallow depths are considered suitable founding strata at a depth of between 1.00m and 1.50m within the main field. Within the smaller field in the east where granular strata was encountered foundations should be a minimum depth of 0.60m. Shallow mining such as bell pits were identified locally at the site and within these areas a deeper foundation solution; trench fill or vibro improved ground may be required in these areas however additional investigation is required to fully assess this risk. Floor slabs within Area B can be ground bearing in areas where less than 600mm of suitably compacted granular material is present beneath finished floor levels however ground gas monitoring has not yet identified a consistent ground gas regime and therefore the need for suspended floor slabs cannot be ruled out at this stage.

Soil Contamination	Localised lead and arsenic contamination marginally in excess of residential screening values was identified within Area A. In addition elevated PAH and hydrocarbon contamination was also notified at one location within Area A. No elevated determinands were identified within Area B and there is no considered risk to site end users from contamination in this area. No asbestos was detected within any of the samples screened across the site.
Ground Gases	Ground gas monitoring is ongoing and a full assessment will be issued upon completion of the monitoring programme. At present basic ground gas precautionary measures for carbon dioxide are likely to be required within Area A. No elevated concentrations have been identified within Area B to date however a consistent gas regime has not yet been identified. In the vicinity of shafts on site gas precautions should be allowed for.
Highways	CBR values of 2% - 5% are likely to be achieved in undisturbed natural soils for pavement design purposes, unless proven otherwise by in-situ testing at sub-base level by a specialist geotechnical engineer.
Further Work	• Completion of gas monitoring programme. • Issue gas assessment. • Additional Intrusive site investigations within previously inaccessible areas (Area A) • Design of remedial strategy. • Treatment of mine workings and shafts. • Demolition Asbestos survey. • Tree survey by qualified arboriculturist. • Detailed Foundation design. • Confirmation of Remedial Strategy with Local Authority.

PROJECT QUALITY CONTROL DATA SHEET

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DRAWINGS

Drawing Number	Rev	Title
C3593/01	-	Site Location Plan
C3593/02	-	Pertinent Site Features Plan
C3593/04A	-	Exploratory Hole Location Plan Area A
C3593/04B	-	Exploratory Hole Location Plan Area B
C3593/06	-	Coal Seam Plan
C3593/07	-	Coal Mining Influence Plan

APPENDICES

APPENDIX A	Exploratory Hole Logs
APPENDIX B	Chemical Testing Results
APPENDIX C	Geotechnical Testing Results
APPENDIX D	Ground Gas Monitoring Results
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**GEO-ENVIRONMENTAL ASSESSMENT REPORT
FOR A SITE AT
HALSNEAD PARK,
WHISTON**

1.0 INTRODUCTION

1.1 Objectives

- 1.1.1 This report describes a Geo-environmental Assessment carried out by Brownfield Solutions Limited (BSL) for Stewart Milne Homes on a site at Halsnead Park, Whiston.
- 1.1.2 The objectives of the assessment were to determine the sites environmental setting and likely site conditions, highlighting potential areas of concern that may govern the sites redevelopment.
- 1.1.3 A main intrusive investigation was undertaken to confirm the findings of the preliminary CSM and risk assessment undertaken by BSL and meet any objectives that had not been satisfied. The main investigation was undertaken using trial pitting, window sampling and rotary open hole drilling.
- 1.1.4 The report has been completed to fulfil the requirements of a preliminary risk assessment in accordance with CLR11 "Model Procedures for the Management of Land Contamination".
- 1.1.5 This report should be read in conjunction with the following reports:
- Desk Study Assessment Report Document Reference No. LC/C3593/7001 Issued July 2017
 - Coal Mining Risk Assessment Document Reference No. LC/C3593/7004 Issued July 2017

1.2 Proposed Development

- 1.2.1 The proposed development is residential end use comprising traditional housing and associated gardens, soft landscaping and hardstanding.

1.3 Limitations

- 1.3.1 This Assessment has been carried out based on information obtained from a number of areas, BSL have assumed that this information is correct.
- 1.3.2 There may be other conditions prevailing on the site which are outside the scope of work and have not been highlighted by this assessment and therefore not been taken into account by this report. Responsibility cannot be accepted for such site conditions not revealed by the assessment.
- 1.3.3 This report has been prepared for the sole use of the client. No other third parties may rely upon or reproduce the contents of this report without the written permission of Brownfield Solutions Ltd (BSL). If any unauthorised third party comes into possession of this report they rely on it at their own risk and BSL do not owe them any Duty of Care.



2.0 THE SITE

2.1 Location & Access

- 2.1.1 The site covers an area of approximately 11.5 hectares and is situated approximately 12.6 kilometres east of Liverpool City Centre.
- 2.1.2 The site is centred on National Grid Reference 347218, 390362 as shown on the Site Location Plan C3593/01.
- 2.1.3 Access to the site is gained off Windy Arbour Road to the west and Lickers Lane to the north.

2.2 Site Description

- 2.2.1 The site is split into two separate parcels of land labelled Area A and Area B. Area A is located in the west with Area B occupying the east of the site. The two areas are not connected and are separated by a road known as Main Drive and two private residential properties with associated out buildings. The areas are described separately below.

Area A

- 2.2.2 The smaller parcel known as Area A is accessed via a set of Palisade gates off Windy Arbour Road to the west. This area is a former garden centre and is irregular in shape with the west of the site generally higher than the east.
- 2.2.3 Area A is largely overgrown and access to areas of the site was difficult due to the dense vegetation. A tarmac car park is present at the site entrance to the west with a derelict bungalow present in the south western corner of the site.
- 2.2.4 A larger steel framed warehouse with steel cladding and with a possible asbestos cement roof is present behind the bungalow.
- 2.2.5 Across the western area evidence of fly tipping was noted although this was noted as being general household rubbish with no evidence of potential contaminants present.
- 2.2.6 The car park area is at a higher elevation than the remainder of the site and the neighbouring properties to the south. A small retaining wall is present in the east of the car park with a concrete ramp present to gain access to the rest of the former garden centre. Across the remainder of the site several hardstanding terraces constructed from breeze block and concrete are present with numerous areas of flags and gravel consistent with greenhouse bases present.
- 2.2.7 The south east of Area A extends out in a semi-circular shape and was heavily wooded with mature trees.
- 2.2.8 The site boundaries of Area A were defined by a mixture of steel palisade fencing, concrete panel fencing and sandstone walls.



Area B

- 2.2.9 The larger parcel of land known as Area B is made up of a large cropped field accessed from Lickers Lane to the north. A wooded area approximately 50m wide and 190m long is present running along the majority of the northern boundary of site.
- 2.2.10 The east of Area B is a smaller field which extends beyond the main field to the site. This area is partially open with sporadic vegetation present in the north becoming denser in the south. Two bunds are present with evidence of dirt biking and off road driving taking place.
- 2.2.11 Area B is bordered by fields to the east and south with a metal wire fencing marking the boundary in the south. Residential properties bound the site in the north western corner with Lickers Lane marking the remaining northern edge of Area B. To the west the site is also bordered by fields.
- 2.2.12 Pertinent site features can be found on the Site Location Plan Drawing Ref C3593/02.

3.0 METHOD OF INVESTIGATION

3.1 Objectives

3.1.1 The aim of the fieldwork was to:

- Investigate ground conditions on the site.
- Assess the potential contamination on the site and obtain samples for contamination screening.
- Assess the potential impact of any contamination on controlled waters.
- Assess the need for detailed investigation.
- Obtain geotechnical information on the ground conditions at the site for preliminary foundation design and preliminary pavement design purposes.
- Install standpipes to allow future monitoring.
- Give an assessment of the geo - environmental risks associated with redevelopment of the site.
- Assess the coal mining risk to the site.

3.2 Site Works

3.2.1 Twelve Window sample boreholes (WS01 to WS12) were drilled to depths of between 1.13m and 3.85m using a tracked window sampling rig and liners (windowless) on 18th and 19th May 2017. Three window sample boreholes were drilled in Area A and nine in Area B.

3.2.2 Thirty trial pits were excavated between depths of between 1.50m and 4.10m using a wheeled excavator between 22nd May and 26th May 2017. Nine trial pits were excavated in Area A and twenty one in Area B.

3.2.3 Nineteen rotary open holes (three in Area A and sixteen in Area B) were drilled using water flush techniques to depths of between 15.00m and 35.00m using a tracked rotary between 13th and 16th June 2017.

3.2.4 The surveyed locations of the exploratory holes for both Area A and Area B are shown on the Exploratory Hole Location Plans. Drawing No. C3593/04A and C3593/04B. The exploratory hole logs are presented in Appendix A.

3.2.5 The exploratory holes were positioned to establish general ground conditions on the site and investigate areas of specific interest such as the former garden centre and coal mining risks. The exploratory holes were logged by an experienced geo-environmental engineer in general accordance with BS 5930 'Code of Practice for Site Investigations' 1999, BS EN 14688-1:2002 'Geotechnical Investigation and Testing – Identification and classification of soil' and BS EN ISO 14689:2002 "Geotechnical investigation and testing – Identification and classification of rock."

3.3 Sampling

3.3.1 During the drilling of the exploratory holes, representative samples were taken at regular intervals to assist in the identification of the soils and to allow subsequent laboratory testing.



3.3.2 A summary of the samples taken is presented in the table below:

Type	Number
Environmental	78
Disturbed	148

3.3.3 The type of sample is dependent upon the stratum and the purpose of analysis in accordance with current environmental and geotechnical guidance.

3.3.4 Disturbed samples of soil for chemical testing were placed in plastic tubs and amber jars as required by the UKAS accredited laboratory, and transported under secure refrigerated conditions.

3.3.5 The distribution of samples taken across the site is recorded on the exploratory logs.

3.4 Laboratory Testing

3.4.1 As part of the assessment for potential contamination of the site, selected samples were taken for the purpose of chemical contamination testing.

3.4.2 The potential contaminative process on site are outlined in the Preliminary Conceptual Site Model. The site works did not identify any visual or olfactory evidence of gross contamination therefore the following suites of determinands were chose to screen for potential site impacts at an UKAS approved laboratory.

Determinand	Matrix	Number
Soil Suite comprising: Arsenic, Cadmium, Chromium (total and hexavalent), Copper, Nickel, Mercury, Lead, Zinc, Selenium, speciated PAHs, phenols, cyanide, organic matter, sulphate and pH	Soil	12
Soil Suite comprising: Arsenic, Cadmium, Chromium (total and hexavalent), Copper, Nickel, Mercury, Lead, Zinc, Selenium, water soluble boron, total and free cyanide, total sulphate, sulphide, sulphur speciated PAHs, phenols, thiocyanate and pH	Soil	8
TPH CWG	Soil	6
Asbestos Screen	Soil	6
Combined Pesticides	Soil	2
Acid Herbicides	Soil	2

3.4.3 The Chemical Laboratory Testing Results are presented in Appendix B.

3.4.4 Representative disturbed samples were obtained for all soil types encountered. Selected samples were scheduled for testing at an approved laboratory in accordance with BS 1377 'Method of Test for Soils for Civil Engineering Purposes' 1990. The following tests were scheduled:

BS Test Number	Description	No of Samples
Part 2:	Natural Moisture Content	20



BS Test Number	Description	No of Samples
Part 2:	Plasticity Index Analysis	20
BRE	pH Value	20
BRE	Water Soluble Sulphate Content	20
BRE	BRE Suite D: Made ground with pyrite	5

3.4.5 The Geotechnical Laboratory Testing Results are presented in Appendix C.

3.5 Monitoring

3.5.1 Gas and water monitoring standpipes were installed in eight window sample boreholes and subsequently two monitoring visits have been undertaken to date. All gas monitoring was undertaken using GA5000 infrared gas meter with integral electronic flow analyser.

3.5.2 Measurements of the percentage volume in air (%v/v) of oxygen (O₂), carbon dioxide (CO₂) and methane (CH₄) were recorded in addition to the percentage Lower Explosive Limit (%LEL) of methane and the atmospheric pressure. Flow measurements on each standpipe (l/hr) were also taken. (Note: 100% LEL equates to 5% by volume).

3.5.3 The standpipes consisted of 35mm internal diameter pipe. A bentonite seal was made around the plain pipe and a clean gravel pack was placed around the slotted pipe. A summary of the installation construction is presented in the table below:

Location	Depth	Response Zone (m bgl)	Targeted Strata	Reason
WS01	1.50	0.50 – 1.50	Made Ground	Ground Gas
WS03	3.00	1.00 – 3.00	Residual and weathered bedrock	Mine Gas
WS04	3.80	1.00 – 3.80	Made Ground/Natural Strata	Ground Gas
WS07	2.30	0.50 – 2.30	Natural Strata/ Coal	Ground Gas/Mine Gas
WS08	2.90	1.00 – 2.90	Natural Strata / bedrock	Ground Gas
WS10	3.00	1.00 – 3.00	Natural Strata / bedrock	Ground Gas
WS11	1.68	0.50 – 1.68	Sand	Ground Gas
WS12	1.13	0.50 – 1.13	Sand	Ground Gas

3.5.4 The results monitored peak and steady state conditions. Peak results are those that occur on opening the valve on the borehole tap. Steady state conditions are those that occur a period of time afterwards when the initial (accumulated) gases have been purged from the borehole.

3.5.5 Interim gas monitoring results are presented in Appendix D of this report.



4.0 GROUND CONDITIONS

4.1 General

4.1.1 The site is split into two development areas, a former garden centre forming 'Area A' and 'Area B' comprising a large cropped field, wooded area and a further smaller elongated field and vegetated area.

4.1.2 Given the two areas being remote from each other with differing previous uses the ground conditions for the areas are described separately below.

4.2 Area A -Made Ground

4.2.1 Made Ground was encountered within all of the exploratory hole locations and was encountered to depths of between 0.30m and to depths in excess of 1.50m. Made ground was not bottomed out within TP26 and TP29 due to complete collapse of the trial pit sides.

4.2.2 In the west of Area A (WS01, TP22 and TP23) where the former car park was located Tarmac and a limestone hardcore subbase was encountered to depths of between 0.20m and 0.30m bgl.

4.2.3 Within TP22 and TP23 made ground was encountered to 0.40m and 0.45m respectively and consisted of a black brown gravelly sand or sandy gravel. The gravel primarily consisted of brick, slag and clinker with brick cobbles also noted locally. A hydrocarbon odour was noted within the made ground in TP22.

4.2.4 Within WS01 the made ground encountered was a soft to firm organic clay with fibrous plant matter, clinker and brick encountered to 0.90m which became a brown sandy clay with brick and plastic noted as being present to base of the made ground at 1.40m.

4.2.5 Across the remainder of Area A the made ground primarily consisted of topsoil or fine limestone gravel at the surface and was encountered to depths of between 0.05m and 0.60m although areas of concrete and flagstones were also present.

4.2.6 The Topsoil and gravel encountered was ashy across the site with localised anthropogenic gravel such as brick, terram, glass, plastic and pottery also present.

4.2.7 Deeper made ground was encountered in the north east of the site to depths of between 1.10m and in excess of 1.50m.

4.2.8 Within WS02 between 0.50m and the base of the made ground at 1.10m a soft to firm black sandy clay was encountered with sporadic limestone gravel and bitumen encountered.

4.2.9 Made ground comprising sandy gravel and cobbles of brick, concrete, flagstones and other mixed lithologies was encountered beneath the surfacing within TP26, TP27 TP29 and TP30.



4.3 Area A - Natural Ground

- 4.3.1 The natural strata underlying the made ground was generally a firm to stiff orange brown sandy clay with localised lenses and stringers of coal encountered to depths of between 1.20m and 2.85m.
- 4.3.2 Within several exploratory holes the clay was noted as grading into residual bedrock.
- 4.3.3 Within the east of Area A within WS03 a firm dark brown black sandy clay with coal fragments was encountered directly beneath the made ground to 0.90m with stiff clay present below. Similarly within WS02 and TP28 a soft grey or black sandy clay with coal fragments was encountered beneath the made ground to depths of 0.50m in TP26 and 1.60m in WS02.
- 4.3.4 TP28 encountered a thin silty sand band between 0.50m and 1.00m with this not observed elsewhere on the site.
- 4.3.5 A stiff black sandy organic clay was present within TP25 between 0.50m and 1.10m.

4.4 Area A – Bedrock

- 4.4.1 Bedrock was encountered between depths of 1.20m and 3.50m across Area A and consisted of a blue grey or brown grey Siltstone or an orange brown Mudstone across area. The bedrock encountered was very weak and highly weathered generally recovered as gravelly clay with the bedrock becoming stronger and less weathered with depth.
- 4.4.2 An inferior coal band 50mm thick was noted within the siltstone in WS03 between 1.50m and 1.55m.
- 4.4.3 Within TP25 a completely weathered band of siltstone, recovered soft grey sandy clay was encountered between 1.90m and 2.60m.
- 4.4.4 Within the deeper rotary boreholes drilled within Area A (RO17 – RO19) the bedrock encountered was interbedded mudstone and siltstone with occasional sandstone bands.
- 4.4.5 Within RO19 coal was present between 10.50m and 11.50m bgl and recorded as a dark grey siltstone with coal bands. The bedrock drilled within Area A was intact to the base of the holes at 15.00m with no loss of flush noted.

4.5 Area A - Groundwater

- 4.5.1 No groundwater was recorded within any of the exploratory holes drilled within Area A.

4.6 Area A - Observations

- 4.6.1 During the works undertaken by BSL observations for both visual and olfactory evidence of contamination were made.



- 4.6.2 Ash, clinker and slag were recorded as being present across the made ground within Area A.
- 4.6.3 In addition, a hydrocarbon odour was noted within TP22 within the made ground at 0.35m.

Side Stability and Ease of Excavation

- 4.6.4 The sides of the trial pits were generally stable, however where deep made ground primarily consisted of brick cobbles were present sides were unstable and complete collapse of pit sides was noted within TP26, TP29 and TP30.

4.7 Area B -Made Ground

- 4.7.1 Thirty window sample boreholes and trial pits were excavated within Area B at the site with made ground encountered within thirteen locations to depths of between 0.35m and 2.80m.
- 4.7.2 In the north west of Area B (TP18, TP19 and WS04) made ground was encountered to depths of between 0.35m and 2.60m bgl. Within TP19 made ground was encountered to 0.35m and consisted of 0.30m of topsoil over 0.05m of black brown subangular to subrounded fine to coarse gravel of coal and mudstone. WS04 consisted of 0.20m of brown sandy clayey topsoil over a stiff to very stiff grey brown sandy clay with fragments of coal and burnt shale present to 1.85m. Two thin coal bands were observed within WS04 at 1.20m to 1.22m and 1.80m to 1.84m. The deepest made ground in the north west of Area B was encountered within TP18 and consisted of topsoil to 0.30m over a firm to stiff orange brown mottled grey sandy gravelly clay with gravel of mixed lithologies to a depth of 0.55m. This was underlain by a black grey mottled red yellow gravel of mudstone, sandstone and seatearth in a sandy clay matrix to a depth of 2.60m.
- 4.7.3 Within TP14 in the south west of the site made ground was encountered to 2.30m bgl. The made ground consisted 0.40m of topsoil over a black grey clay bound gravel of coal and mudstone with the gravel noted as being erratically ordered. It was noted that within the east of the trial pit natural clay was encountered beneath the topsoil with the made ground appearing to infill a pit.
- 4.7.4 TP15 and TP16 located to the north of TP14 contained made ground to 0.60m bgl and 1.20m respectively. Within TP15 the made ground consisted of topsoil over grey brown gravel of weathered coal, mudstone and siltstone. Within TP16 topsoil was encountered to 0.40m and was underlain by a black gravel of coal and carbonaceous mudstone in a clay matrix. Natural clay strata was encountered beneath the topsoil in the north of the pit with a land drain encountered at 0.70m in the south.
- 4.7.5 In the south east of the main field within Area B (TP08 and WS10) made ground was encountered to a depth of 1.20m within both holes. Topsoil was encountered to 0.20m within WS10 and 0.40m in TP08. Below the topsoil in WS10 a grey ashy sandy gravelly clay was encountered. The gravel consisted of coal, burnt shale and other mixed lithologies. Within TP08 the made ground was a gravelly sandy clay with gravel of coal and seatearth.



- 4.7.6 A thin band of reworked coal and mudstone gravel was encountered within TP09 between 0.40m and 0.50m. TP09 was located to the north of TP08.
- 4.7.7 In the north east of the main field within Area B within TP01, TP02 and TP03 the topsoil was noted as containing anthropogenic material such as brick, plastic, clinker and pottery to depths of between 0.40m and 0.45m. Within TP02 below the topsoil a brown sandy gravelly clay containing coal, sandstone, siltstone and glass was present to 0.80m.
- 4.7.8 A land drain was encountered at within TP10 at 0.50m.

4.8 Area B - Natural Ground

- 4.8.1 Where made ground was absent in Area B a sandy gravelly topsoil was present to depths of between 0.15m and 0.50m. Coal fragments were observed locally within the topsoil.
- 4.8.2 The dominant superficial strata within Area B was a stiff to very stiff orange brown or red brown slightly sandy to sandy clay with varying amounts of gravel. This strata was encountered 0.75m and 3.30m. Within several exploratory holes the clay was noted as grading into residual bedrock. Within TP18 this clay was noted as being soft beneath the made ground to the base of the hole at 2.80m.
- 4.8.3 Superficial sand strata was encountered in the smaller field in the east within WS11, WS12, TP04 and TP05. This was observed as being a red brown or orange brown slightly clayey sand and was encountered to depths of between 0.50m and 1.30m. Within these holes the sand is considered to be completely weathered sandstone bedrock.
- 4.8.4 This strata was also encountered in the south east of the main field within TP08 and TP09 to depths of between 1.50m and 2.25m. Within TP09 this was underlain by clay.
- 4.8.5 Beneath the made ground in WS10 a soft to firm dark grey clay was encountered between 1.20m and 1.60m which was then underlain by a firm clay to 1.90m.
- 4.8.6 Superficial sand strata was also encountered in a large lens across the north of the investigated area within TP01, TP17 and TP04 to depths of between 0.60m and 1.10m with this sand observed as being brown and clayey. Within TP02 also located in the north, the clay strata was observed as being very sandy and clayey sand in parts.

4.9 Area B – Bedrock

- 4.9.1 Bedrock was encountered between depths of 0.75m and 3.30m across Area B and consisted of a grey Siltstone or an orange brown Mudstone across the main field. The bedrock encountered was very weak and highly weathered generally recovered as gravelly clay with the bedrock becoming stronger and less weathered with depth. A general trend of depth to bedrock was recorded as being deepening from north to south.



- 4.9.2 Within the smaller field sandstone bedrock was encountered generally at shallow depths of between 0.50m and 1.30m, within TP04 completely weathered Sandstone as not encountered until 2.40m bgl.
- 4.9.3 Coal subcrops were recorded at rockhead within WS07, TP01 and TP03 and are discussed further below.
- 4.9.4 Coal seams were encountered in ten of the rotary boreholes, four trial pits and one window sample boreholes across Area B. The locations, depths and seams is presented in the table below.

Location	Depth (m bgl)	Thickness (m)	Interpreted Coal Seam
WS07	1.75 – 2.34 (refusal)	0.59+	Yard
TP01	2.30 – 3.20	0.90	Lower Florida
TP03	1.20 – 3.70	2.50	Earthy Delph
TP08	3.10 – 3.30 (refusal)	0.20+	Yard
TP09	2.70 – 3.80 (refusal)	1.10	Yard
RO01	7.50- 8.70	1.20	Higher Florida
RO01	18.70 – 19.90	1.20	Lower Florida
RO02	15.70 – 16.90	1.20	Discovery
RO02	18.20 – 19.20	1.00	Discovery
RO03	20.90 – 21.90	1.00	Lower Florida
RO03	32.00 – 32.50	0.50	Unknown
RO04	16.10 – 17.20	1.10	Lower Florida
RO05	15.60 – 16.90	1.30	Lower Florida
RO06	4.50 – 5.20	0.70	Yard
RO08	1.50 – 3.00	1.50	Higher Florida
RO12	4.00 – 10.50	5.50	Interbedded very weak siltstone/mudstone and coal
RO12	18.30 – 19.50	1.20	Yard
RO13	10.40 – 11.60	1.20	Weak interbedded siltstone and coal
RO13	21.70 – 22.80	1.10	Lower Florida
RO13	31.70 – 32.40	0.70	Unknown
RO14	20.50 – 21.70	1.20	Earthy Delph
RO14	23.30 – 24.30	1.00	Higher Florida

- 4.9.5 Losses of flush during the borehole drilling were noted as below:

Location	Depth (m bgl)	Thickness (m)	Description
RO03	9.20 – 10.40	1.20	Soft drilling, loss of flush (regained)
RO05	3.50 – 6.00	2.50	Soft drilling, loss of flush (regained)
RO07	15.50 – 16.00	0.50	Weak/fractured, loss of flush
RO08	9.50 – 10.50	1.00	Broken Ground, loss of flush
RO09	5.00 – 9.50	4.50	Soft/broken ground total loss of flush
RO09	9.50 – 11.00	1.50	Weak Drilling no return
RO11	9.50 – 12.50	3.00	Soft/broken ground total loss of flush



Location	Depth (m bgl)	Thickness (m)	Description
RO16	3.50 – 6.50	3.00	Very weak ground (flush regained)
RO16	9.00 – 10.50	1.50	Soft/broken ground total loss of flush

- 4.9.6 The loss of flush was encountered from 3.50m to 6.50m within RO16 may be due to the ground conditions.

4.10 Area B- Groundwater

- 4.10.2 Groundwater was generally absent across exploratory holes drilled within Area B with localised strikes encountered in the north east and north west of the site.

Location	Depth (m bgl)	Thickness (m)	Description
WS04	2.50	Mudstone	Strike
TP01	2.30	Coal	Strike
TP02	1.80	Sandy Clay	Slow Seepage

- 4.10.3 Where laminated siltstone and mudstone was encountered the rock was observed as being damp along the laminae.

4.11 Area B - Observations

- 4.11.2 During the works undertaken by BSL observations for both visual and olfactory evidence of contamination were made.
- 4.11.3 Localised ash was noted within made ground within WS10 with no further evidence of contamination noted.

Side Stability and Ease of Excavation

- 4.11.3 The sides of the trial pits were generally stable, however within TP18 where deep made ground was present the sides were noted as being unstable.



5.0 TEST RESULTS

5.1 Chemical Test Results - Soils

- 5.1.1 The samples were tested for an assessment of the chemical contamination and results were examined with reference to a selection of guidance documents as detailed in Appendix E.
- 5.1.2 The apparent exceedence of the relevant Tier 1 generic screening value for a residential end use with plant uptake is taken as indicating further detailed assessment or remedial action is required.
- 5.1.3 All metals (with the exception of lead), PAHs and TPH were screened against the LQM/CIEH S4ULS and SGV's for a residential property. Lead was screened against a final C4SL value of 200mg/kg.

- **Metals**

The following elevated metal concentrations were recorded within Area A at the site.

Location/Depth (m)	Metal	Concentration (mg/kg)	Screening Value (mg/kg)
WS01 - 0.40	Arsenic	45.3	32 (C4SL)
	Lead	205	200 (S4UL)
TP27 - 0.50	Lead	246	200 (S4UL)

No elevated concentrations of metals were encountered within Area B.

- **PAHs**

Elevated concentrations of Polycyclic Aromatic Hydrocarbons were recorded above S4UL values within the made ground at one location within Area A.

Location/Depth (m)	Determinand	Concentration (mg/kg)	Screening Value (mg/kg)
TP22 – 0.25	Benzo(a)anthracene	65.58	7.2
	Chrysene	51.26	15
	Benzo(a)pyrene	68.07	2.2
	Ideno(123cd)pyrene	46.17	27
	Dibenzo(ah)anthracene	5.36	0.24
	Benzo(b)fluoranthene	85.55	2.6

Interpretative analysis undertaken indicates the levels of contaminant to be consistent with PAHs, lubricating oil and possible tarmac/bitumen.

No elevated concentrations of PAH's were identified within Area B.

- **Hydrocarbons**

Within TP22 at 0.25m elevated hydrocarbons were also identified as being in excess of the screening guideline values as outlined in the table below.



TPH Band	Concentration (mg/kg)	Screening Value (mg/kg)
Aromatic EC16-EC21	1772	260
Aromatic EC21-EC35	6689	1100

No concentrations of BTEX compounds above laboratory detection limits were identified at the site.

- **Asbestos**

No asbestos fibres were identified within any of the samples screened at the site.

- **Pesticides/Herbicides**

No concentrations of pesticides or herbicides above laboratory detection limits were recorded within samples tested at the site.

5.2 Geotechnical Testing

5.2.1 After modification of particle size in accordance with NHBC Chapter 4.2 the modified plasticity indices are tabulated below:

Area	PI (%)	Plasticity	Modified PI (%)	Volume Change Potential
A	10-33	Low to high	9-31	Low to medium
B	10-34	Low to high	10-31	Low to medium

5.2.2 Within Area A the plasticity index results were generally low between 10% and 15%. The shallowest sample tested within superficial clay within WS03 yielded a modified PI of 31% with a sample tested within the residually weathered to highly weathered mudstone at 2.20m having a modified PI of 24% showing a decrease in the volume change potential with depth.

5.3 Aggressive Ground Conditions/SD1 Testing

Area A

5.3.1 Water soluble sulphate testing was undertaken on two samples of made ground, two of the mudstone strata and two of the natural clay strata. The results are presented in the table below.

Determinand	Made Ground	Superficial Clay	Mudstone/Siltstone
Sulphate as SO ₄ (g/l)	0.1015 - 0.3751	0.0172 – 0.0223	0.0105 – 0.0480
pH	7.81 - 7.88	7.58 – 8.03	6.59 – 7.82

Area B

5.3.2 Water soluble sulphate testing was undertaken on eight samples of made ground, three of topsoil, two of the siltstone strata, twelve of the natural clay strata and one of sand. The results are presented in the table below.



Determinand	Made Ground	Topsoil	Superficial Clay	Siltstone	Sand
Sulphate as SO ₄ (g/l)	0.0087 - 0.052	0.0134 – 0.0640	0.0018 – 0.0508	0.0198 – 0.0277	0.0069
pH	5.03 – 7.03	6.35 – 7.94	6.93 – 8.43	6.46 – 7.42	7.48

- 5.3.3 Full BRE suite testing was undertaken on five sample of coal. Where low pHs were identified additional chloride and nitrate testing was undertaken. The results are presented in the table below.

DETERMINAND	LOCATION				
	WS07 – 1.80m	TP01 – 2.35m	TP03 – 1.25m	TP08 – 3.15m	TP09 – 2.80m
Soluble Chloride g/l	0.003	-	0.004	-	-
Soluble Nitrate g/l	<0.0025	-	0.0104	-	-
Soluble Sulphate g/l	0.7312	0.0270	0.0171	0.0555	0.2163
pH	2.72	6.41	4.70	6.77	6.62
Sulphur as S, Total %	3.55	0.22	0.19	1.50	1.24
Sulphate, as SO ₄ , Total %	0.25	0.02	0.02	0.02	0.13

5.4 Gas Monitoring Results

- 5.4.1 Two gas monitoring visits have been carried out to date on 23rd May and 5th June 2017.
- 5.4.2 Within Area A peak carbon dioxide has been recorded at concentrations of between 6.5%v/v and 18.5%v/v with steady state concentrations ranging between 6.0%v/v and 17.7%v/v.
- 5.4.3 Within Area B peak carbon dioxide has been recorded at concentrations of between 0.1%v/v and 9.3%v/v with steady state concentrations ranging between 0.0%v/v and 9.0%v/v. Within Area B levels of carbon dioxide in excess of 5%v/v has been recorded within WS04 only.
- 5.4.4 To date methane has been recorded at a maximum concentration of 0.1%v/v within WS01 only.
- 5.4.5 Within Area A oxygen concentrations of between 0.8%v/v and 17.1%v/v have been recorded during the monitoring programme. Steady state concentrations have ranged between 0.8%v/v and 17.2%v/v. Within Area B oxygen concentrations of between 12.2%v/v and 21.2%v/v. Steady state concentrations have ranged between 12.3%v/v and 21.4%v/v.



- 5.4.6 A maximum positive gas flow of 0.2l/hr has been detected within Area A and of 0.2l/hr within Area B.
- 5.4.7 Atmospheric pressure has ranged between 1008mb and 1015mb.
- 5.4.8 Groundwater levels of between 0.84m and 2.66m bgl have been recorded in the standpipes to date. No groundwater has been recorded in Area A or in the east of Area B.



6.0 MINING ASSESSMENT

6.1 Coal Mine Workings

- 6.1.1 Evidence of coal mine workings can be represented by voids, broken ground and/or loss of flush with evidence of potential workings indicated by intact coal of a suitable workable thickness and quality. An assessment should be made based on all the available evidence.
- 6.1.1 Coal seams of a workable thickness were encountered across Area B at the site. Triangulation of the boreholes was undertaken to determine the approximate outcrop locations as well as dip and direction. The coal seams are shown on the Coal Seam Plan Drawing No. C3593/06.
- 6.1.2 The mining investigation did not identify any worked ground within Area A, however interpretation of the coal seams indicates coal could be at a workable thickness within Area A and it is therefore recommended that further investigation is undertaken following clearance of the site.
- 6.1.3 Broken ground, soft drilling and loss of flush indicative of underground workings was recorded within the Earthy Delph, Higher Florida, Lower Florida at the site.

Location	Depth (m bgl)	Thickness (m)	Coal Seam Worked	Description
RO03	9.20 – 10.40	1.20	Higher Florida	Soft drilling, loss of flush (regained)
RO05	3.50 – 6.00	2.50	Higher Florida	Soft drilling, loss of flush (regained)
RO07	15.50 – 16.00	0.50	Lower Florida	Weak/fractured, loss of flush
RO08	9.50 – 10.50	1.00	Lower Florida	Broken Ground, loss of flush
RO09	5.00 – 9.50	4.50	Earthy Delph	Soft/broken ground total loss of flush
RO09	9.50 – 11.00	1.50	Higher Florida	Weak Drilling no return
RO11	9.50 – 12.50	3.00	Earthy Delph	Soft/broken ground total loss of flush
RO16	3.50 – 6.50	3.00	Earthy Delph	Very weak ground (flush regained)
RO16	9.00 – 10.50	1.50	Higher Florida	Soft/broken ground total loss of flush



- 6.1.4 Reworked ground within trial pits and window samples and loose or soft overburden within the rotary boreholes it is suggestive of outcrop mining within the seams beneath the site.
- 6.1.5 All coal seams encountered were indicated to be intact in parts suggesting pillar and stall type workings, which would typically leave 60% of the seam in place.
- 6.1.6 The Pasture seam is not considered to have been encountered at the site and is anticipated to subcrop to the south east of the site.

6.2 Structure

- 6.2.1 Based on the boreholes to date the strata appear to dip down the south east. Comparing the coal seam inferred to be the Lower Florida encountered in holes RO1, RO4, RO7 and RO13 it can be seen the coal to the west is deeper than that to the east. Using the depth of the seam and proximity of the holes the dip of the strata is calculated as 7°.
- 6.2.2 The dip of the beds is shallower than what is indicated on the geological maps, this may be due to the faulting to the east and west of the site.
- 6.2.3 The large scale Eccleston West Fault which was indicated to run parallel with the eastern site boundary on geological mapping is likely further to the west than previously thought. Exploratory holes in the east of the site within the smaller field did not encounter coal measures with sandstone typical of the Kinnerton Rock identified within this area. The postulated termination of the coal seams based on the findings of the site investigation is shown on the Coal Seam Plan.

6.3 Subsidence Risk

- 6.3.1 The Coal Mining Risk Assessment (Ref: LC/C3593/7004) identified a risk to the proposed development from recorded mine entries, unrecorded mine entries and unrecorded mine workings.
- 6.3.2 Evidence of unrecorded mine workings was identified during the investigation in the form of shallow bell pits, soft or reworked ground and the absence of coal where it was anticipated within exploratory holes however intact coal at rockhead was encountered within several exploratory holes also indicating that workings are likely to be pillar and stall type..
- 6.3.3 Within the rotary boreholes drilled on site broken ground and soft ground indicative of collapsed workings were identified at the site. The workings were predominantly located in the east of the site with the Higher Florida seam appearing to be being the most extensively worked seam.
- 6.3.4 Evidence of potential bell pits were noted within TP14, TP18 and WS10 to a maximum recorded depth of 2.60m. Rotary boreholes in the east of the site within RO09 and RO16 identified weak or loose overburden and soft or broken ground at rockhead which is indicative of shallow mine workings accessed from the surface.
- 6.3.5 The mine shafts at the site where not investigated during this phase. The two shafts within Area A are at present anticipated to be outside the proposed development

layout as is the case for the two seams in the far south eastern corner of Area B however the shafts may have a zone of influence which would affect the proposed development layout and should therefore be investigated. Within the main field of Area B a shaft to the Higher Florida is shown to be present on coal mining abandonment plans. As the Higher Florida is the seam which has been most extensively worked at the site this information appears to be accurate and the location of the shaft can now be more accurately plotted and investigated during subsequent drilling and grouting. The depth of the shaft was 22m to the Higher Florida indicating its location to be in the vicinity of RO14.

- 6.3.6 CIRIA SP32 “Construction over abandoned mine workings” indicates that a void will not migrate to the surface where there is more than ten times the seam thickness of rock cover. Up to this depth the void will begin to choke with rock from the roof (represented by broken ground). Beyond 10 times the seam thickness the rock will tend to arch and prevent upwards migration of the void.
- 6.3.7 Coal seams are present below the site and have been proven to be worked in places, with insufficient rock cover over the workings meaning there is potential for foundations of the proposed buildings potentially being affected by crown holing. The anticipated zone of influence at the surface for each of the seams is shown on the Coal Mining Influence Plan Drawing No. C3593/07.

6.4 Mining Recommendations

- 6.4.1 The mineworks will require drilling and grouting underneath the plots to a depth where there is more than 10 times thickness of rock cover over the seam/workings.
- 6.4.2 As multiple seams have been worked there is a risk that seams can collapse into each other and this will involve the treatment of multiple seams below some plots.
- 6.4.3 The treatment is likely to involve a sequence of test drilling and grouting in some areas, this will determine on a plot by plot basis the sequence and also provide a better indication of where grout is likely to be required.
- 6.4.4 On completion of the drilling and grouting works the foundations will need to be designed to cope with any residual subsidence risk.
- 6.4.5 Geophysics should be considered as an initial phase of investigation of potential shaft, any anomalies can then be targeted for further investigation, this could be a site strip looking for visual evidence and then closely space boreholes to confirm the presence.
- 6.4.6 Once the shaft has been located, it should be filled with grout and capped at rockhead. Cap size is usually at least twice the diameter of the shaft. Once the cap is in place the Coal Authority will not generally permit any building over the top of the shaft.

7.0 GEOTECHNICAL ASSESSMENT

7.1 General

- 7.1.1 The site is split into two parcels of Land referred to as Area A and Area B which are described separately within this report.
- 7.1.2 Area A was a former garden centre with buildings and greenhouses bases still present. Made ground was encountered to depths of between 0.30m and in excess of 1.50m. The made ground encountered was generally granular and comprising cobbles of brick and concrete within a sandy and or clayey matrix.
- 7.1.3 No evidence of shallow mining issues were found within Area A during the site investigation. However access was limited within this portion of the site due to it being heavily vegetated and additional investigation may be required to further assess the risk from coal mining and to locate the two known mine shafts within this area. Interpretation of the result from Area B indicates that there should be shallow seams, although these have not been encountered.
- 7.1.6 Area B is largely an open field. Made ground is present locally and this is interpreted to be associated with outcrop mining. Bedrock across the remainder of Area B consisted of siltstone and mudstone with coal seams present at shallow depths.
- 7.1.7 The mining investigation identified soft and broken ground proving shallow mining to have been undertaken below the site. A risk at the surface from shallow workings was identified across the main field within Area B.
- 7.1.8 A detailed development layout is not yet available and therefore the recommendations below are preliminary. A detailed foundation assessment should be undertaken once finished site levels, development layout and mining remediation details are known.

7.2 Area A – Foundations

- 7.2.1 The most suitable foundations for houses within Area A are considered to be unreinforced strip foundations founding on residual/weathered bedrock or stiff clays at depths of between 1.20m and 1.50m bgl. The clay on the site is of low to medium volume change potential, therefore the foundations should be at a minimum depth of 0.90m in the Clay, deeper near trees and hedges in accordance with NHBC Chapter 4.2.
- 7.2.2 Localised pockets of deeper made ground in excess of 1.50m were identified at the site and therefore foundations may need to be deepened in areas and it may be more cost effective for trench fill or mass fill foundations to be undertaken in these areas.
- 7.2.3 Foundations will need to be taken to the underside of any Made Ground to found on undisturbed natural ground this will be to approximately 1.20m to 2.00m bgl. A nett allowable bearing pressure not exceeding 125kN/m² should be assumed within stiff clays or weathered bedrock at these depths.



- 7.2.4 It is possible that a change in bearing stratum across individual plots may occur in this area. If any sudden changes from clay to sand, gravel or non-plastic bedrock are encountered reference should be made to a suitably qualified engineer, recommendations may include that the foundations should either be deepened to found on the same stratum, or reinforced to reduce the potential for differential settlement.
- 7.2.5 The bearing stratum should be inspected for 'soft spots' within the natural clay strata, resulting for instance from localised groundwater perched within the overlying fill materials. Any such soft spots should be dealt with in accordance with good site practice.
- 7.2.6 If the ground conditions encountered during the construction phase differ significantly to the conditions encountered during construction, work should cease and BSL contacted for further advice.
- 7.2.7 During the construction phase supervision should be on a continuous basis to check the design assumptions are correct and construction conforms to design. Supervision should include inspections, Control Ground Investigations and monitoring.

7.3 Area B – Foundations

- 7.3.1 Within Area B a mixed foundation solution is likely to be the most suitable solution as localised pockets of deep made ground associated with mine workings are present across the site.
- 7.3.2 Within the main field following drilling and grouting of workings and shafts the proposed development will not be affected by underground workings at the surface and therefore shallow strip foundations founding on superficial clays or weathered bedrock are considered to be the most suitable foundation solution for the majority of the site. As with Area A clays are of a low to medium volume change potential and therefore foundations should be a minimum of 900mm below existing ground levels. At a depth of between 1.00m and 1.50m within the main field of Area B a net allowable bearing pressure of 125kN/m² should be assumed. A large wooded area is present in the north of Area B and foundations may need to be deepened to found in non-plastic bedrock within the zone of influence in accordance with NHBC Chapter 4.2.
- 7.3.3 In the east of Area B superficial sand deposits were encountered at shallow depths and were underlain by sandstone bedrock. Within this area foundations should be a minimum of 600mm below finished ground levels. A net allowable bearing pressure of 200kN/m² should be assumed at this depth for granular strata.
- 7.3.4 Deeper pockets of reworked ground associated with shallow coal mining activities were identified locally within the main field of Area B. Once the development layout is known it is recommended further investigation to identify the extents of made ground followed by a foundation zonation plan is undertaken. Within trial pits and window sample boreholes excavated on site made ground was encountered to a



maximum depth of 2.60m and therefore trench fill foundations founding on competent bedrock below are anticipated to be the most suitable solution.

- 7.3.5 Rotary drilling identified potentially deeper or areas of made ground or poor ground conditions particularly in the vicinity of RO09, RO12 and RO16 to depths in excess of 5.00m. However due to the nature of the drilling method it is not possible to accurately determine made ground depths in these exploratory holes and made ground may not be present to these depths. Additional investigation is required in this area during treatment of mine workings to establish whether a deeper foundation solution or treatment such as vibro ground improvement is required.

7.4 Building Near Trees

- 7.4.1 If foundation excavations encounter cohesive strata in the vicinity of existing, proposed or recently removed trees, foundations should be adjusted in full accordance with NHBC Standards Chapter 4.2. All foundations should be deepened below roots of greater than 5mm diameter during excavations for footings. The clay is of a low to high volume change potential.
- 7.4.2 A survey of all trees and hedges on the site and within influencing distance of the site boundary should be undertaken to identify tree species and heights. This information will be required in order to assess the effects of trees on the cohesive strata.
- 7.4.3 Where foundation depths due to trees already present or recently removed exceeds 1.50m there is a possibility for heave to occur on removal of the tree. NHBC Guidance states that compressible material or void former is required against the inside face of all external wall foundations.

7.5 Floor Slabs

- 7.5.1 Ground bearing floor slabs may generally be adopted at the site provided that once finished levels have been established, less than 600mm of suitable appropriately compacted granular material exists beneath the slab. However due to ground gas precautions likely being required across large portions of the site we would recommend suspended floors throughout at this stage.
- 7.5.2 Where foundation depths due to trees already present exceeds 1.50m there is a possibility for heave to occur on removal of the tree. NHBC Guidance states that either a precast concrete floor, a suspended timber or in-situ concrete floor must be used. We recommend the former, the required void size for beneath floor slabs on this site is between 250mm and 300mm high depending on volume change of the different strata encountered.
- 7.5.3 Where made ground in excess of 600mm is generally present and floor slabs will need to be suspended or pre-cast concrete.

7.6 Construction

- 7.6.1 Instability of excavations through natural soils is not anticipated provided they are not exposed to adverse weather conditions for any substantial period of time.

Instability of the Made Ground should be allowed for. All excavations should be carried out in accordance with CIRIA Report 97 'Trenching Practice'.

- 7.6.2 Excavation depths should generally be readily achieved using conventional plant (JCB or similar) although high specification plant (tracked 360° or similar) is recommended to maintain the build programme. Breaking equipment may also be required locally to penetrate old foundations associated with former construction.
- 7.6.3 The results of laboratory pH and sulphate content indicate that ACEC Class AC-1 and sulphate class DS-1 conditions prevail within the superficial deposits and bedrock in accordance with BRE Special Digest 1 "Concrete in aggressive ground" 2005.
- 7.6.4 ACEC Class AC-2Z and sulphate class DS-1 conditions prevail in coal due to low recorded pHs.
- 7.6.5 The specific concrete mixes (the Design Concrete Class) to be used on site will be determined by the site specific concrete requirements in terms of the durability and structural performance. These are assessed in terms of the Structural Performance Level (SPL) and any need for Additional Protective Measures (APM) detailed in Part D of BRE Special Digest 1 with further guidance in Pt E and F.

7.7 Highways

- 7.7.1 CBR values of 2% - 5% are likely to be achieved in undisturbed natural soils for pavement design purposes, unless proven otherwise by in-situ testing at sub-base level by a specialist geotechnical engineer.
- 7.7.2 Some reengineering of the subgrade will be required prior to highway construction to achieve the required design CBR value.
- 7.7.3 The soils are considered to frost susceptible due to the fines content, highway construction should be a minimum thickness of 450mm to mitigate against the risk.

7.8 Soakaways

- 7.8.1 The use of soakaways within the natural ground is not feasible at the site due to the presence of relatively impermeable strata underlying the site.
- 7.8.2 If drainage of the highway to soakaways is to be considered it is suggested that this is discussed with the Local Authority at the earliest opportunity, to confirm the adequacy of proposed testing and to allow their inspection of any testing.



8.0 ENVIRONMENTAL ASSESSMENT

8.1 General

- 8.1.1 The level of protection for the clean potable water supply pipes should be determined using the local water company risk assessment criteria in accordance with UKWIR.

8.2 Contamination

Soils

- 8.2.1 Within Area A made ground was encountered to depths of up to 1.50m although this was not bottomed out at two locations. The made ground encountered was generally granular fill predominantly comprising brick.
- 8.2.2 On the basis of the testing undertaken to date it would appear that there is localised metal PAH and hydrocarbon contamination above residential screening guideline values within the car parking area of Area A (WS01 and TP22). The contamination was located within the near surface made ground.
- 8.2.3 In addition a marginally elevated lead concentration was present within made ground in TP27 located in the north east of Area A.
- 8.2.4 Within Area B made ground was encountered to a maximum depth of 2.60m and was generally associated with shallow coal mining.
- 8.2.5 No elevated metal, PAH or hydrocarbon contamination was identified within samples tested in Area B.
- 8.2.6 No asbestos was identified within any samples tested from either area.

Permanent Ground Gases

- 8.2.7 In order to assess the ground gas situation and the requirement for ground gas precautionary measures at the site, guidance was taken from CIRIA C665 'Assessing risks posed by hazardous ground gases to buildings' and BS8485:2015 'Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'.
- 8.2.8 The proposed residential end use dictates that the gas monitoring results are assessed in accordance with Boyle and Witherington (1998). The Boyle and Witherington method uses the concept of a Gas Screening Value (GSV) which is calculated using the maximum concentration of ground gas and flow rate. The GSVs are then compared to the NHBC traffic light system to determine the risk category of the site and the need for gas protection measures.
- 8.2.9 Based on the initial monitoring, typical carbon dioxide concentrations in excess of 5%v/v have been encountered in Area A and as such are likely to fall into Gas Characteristic Situation 2. Based on these results, gas protection measures will be required within Area A as a minimum.

8.2.10 No elevated concentrations have been identified to date within Area B however concentrations near to the 5%v/v threshold have been identified. It is recommended at this stage that ground gas precautions are allowed for. Additional precautions in the vicinity of any shafts may be required by the Coal Authority.

8.2.11 A full ground gas assessment will be issued on completion of the monitoring programme.

8.3 Qualitative Risk Assessment

8.3.1 The risk assessment methodology used in this instance is based on **Source – Pathway – Receptor** (SPR) philosophy. The **source** is the presence of contamination, or substance/event likely to cause harm. The **receptor** is the target that may be detrimentally affected by the source. The **pathway** is the means of the contamination to move from the source to the receptor. Where any of these three factors are removed there is deemed to be no risk.

8.3.2 The CSMs have been revised based on the findings of the site investigation and laboratory testing results.

Human Health

Potential Source	Potential Pathway	Potential Receptor	Likelihood	Severity	Level of Risk
ON-SITE					
Made Ground	Ingestion, direct contact, inhalation of dusts.	End-users	Low Likelihood	Medium	Moderate/Low
Garden Centre (Area A)	Ingestion, direct contact, inhalation of dusts.	End-users	Unlikely	Medium	Low
Backfilled Ponds (Area A)	Migration of ground gases into confined spaces.	End-users	Low likelihood	Medium to Severe	Moderate /Low
Mine Shafts	Migration of mine gas into confined spaces.	End-users	Likely to Low Likelihood	Medium to Severe	High/Moderate

Human Health Justification

8.3.3 Within Area A localised slightly elevated lead and arsenic contamination was identified within made ground within WS01 with PAH and diesel range hydrocarbons identified within shallow made ground within TP22. Both of these exploratory holes are located within the former car parking area of Area A and are assessed as a moderate to low risk to site end users. A marginally elevated lead concentration was also identified within made ground within TP27 also located within Area A. Where gardens and soft landscaping are present it is recommended that a cover system is implemented to mitigate the risk and prevent undesirable contamination being brought to the surface. Alternatively source removal of contaminated soils from affected areas may be a viable solution. It is recommended that contaminated areas are further investigated and delineated to ensure sufficient remedial measures are implemented.



- 8.3.4 Within Area B no elevated contaminants were identified within made ground or topsoil and the risk within this area is considered to be Low.
- 8.3.5 No pesticides or herbicides above laboratory detection limits were identified within samples tested at the site and therefore the risk associated with the former garden centre is considered to be low.
- 8.3.6 Ground gas monitoring is ongoing at the site and a full assessment will be made upon completion of the gas monitoring programme. Based on current results elevated concentrations of carbon dioxide have been identified within Area A and therefore it is anticipated that gas precautionary measures are likely to be required within this portion of the site. The risk from ground gas is therefore still assessed as being moderate to low from backfilled ponds and high from mine shafts.

Controlled Waters

Potential Source	Potential Pathway	Potential Receptor	Likelihood	Severity	Level of Risk
Made Ground	Migration through groundwater or granular soils	Controlled waters	Unlikely	Low	Low

Controlled Waters Justification

- 8.3.7 Although elevated concentrations of PAHs and hydrocarbons were identified within TP22 within Area A, the contamination was identified as being localised. No groundwater was encountered during drilling within Area A with no groundwater identified within subsequent gas and groundwater monitoring at the site. The natural superficial deposits of impermeable clay and mudstone will prevent the leaching and migration of any contaminants into both surface and groundwater. The risk to controlled waters is therefore considered to be low.

8.4 Remedial Measures

- 8.4.1 Across the majority of the site, where no made ground was no remedial measures are required. Good quality topsoil was present across the majority of the site and may be suitable for reuse within garden areas subject to confirmatory testing.
- 8.4.2 In Area A where contaminated made ground was present a cover system comprising clean subsoil and topsoil should be provided within gardens and soft landscaping area. Due to the presence of metals, PAHs and hydrocarbons. This should be 600mm thick in garden areas and 450mm in soft landscaping areas. This will allow plants to be grown and prevent undesirable soils being brought to the surface.
- 8.4.3 Alternatively it may be more cost effective to remove the source of contamination from the gardens and soft landscaping areas and potentially re-use under hardstanding or within public open space areas subject to additional testing or alternatively removed from site. The topography of Area A shows a fall in levels of approximately 4m from west to east and therefore a reduction in site levels may allow for contaminated material to be easily removed. If this is considered to be the desired option confirmatory samples of remaining natural material should be

undertaken to confirm no contaminants remain at the site and the cover system may be reduced to that of the rest of the site.

8.4.4 Ground gas monitoring is ongoing, at present ground gas precautionary measures are likely to be required within Area A however no consistent ground gas regime has been identified within Area B. A full assessment will be made upon completion of the ground gas monitoring programme.

8.4.5 A watching brief should be in place during the construction phase for any evidence of any contamination. If any contamination is encountered work should cease in that area and BSL consulted.

8.5 Asbestos

8.5.1 The investigation of asbestos issues within structures was beyond the scope of this report. However, guidance from UK Government indicates that asbestos should be assumed to be present in buildings unless proven otherwise.

8.5.2 Any asbestos within structures will require removal prior to re-development. This will need to be done by a suitably qualified experienced and licensed contractor, who ensures that adequate PPE is provided to operatives, and that all the relevant legislation is adhered to.

8.6 Health and Safety Issues

8.6.1 During the reclamation and construction phases of the site development it will be necessary to protect the health and safety of site personnel. The risk to construction and ground workers is assessed in the table below:

Potential Source	Potential Pathway	Potential Receptor	Likelihood	Severity	Level of Risk
ON-SITE					
Made Ground	Ingestion, direct contact, inhalation of dusts.	Construction Workers	Unlikely	Medium	Low

Discussion

8.6.2 The risk from made ground will be mitigated by standard PPE including gloves. Welfare facilities should be made available to wash before hand to mouth activities.

8.6.3 General guidance on these matters is given in the Health and Safety Executive (HSE) document "Protection of Workers and the General Public during the Redevelopment of Contaminated Land". In summary, the following measures are suggested to provide a minimum level of protection:

- All ground workers should be issued with the relevant protective clothing, footwear and gloves. These protective items should not be removed from the site and personnel should be instructed as to why and how they are to be used.
- Hand-washing and boot-washing facilities should be provided.

- Care should be taken to minimise the potential for off-site migration of contamination by the provision of dust suppression control and wheel cleaning equipment during the construction works.
- Good practices relating to personal hygiene should be adopted on the site.
- The contractor shall satisfy the Health and Safety Executive with regard to any other matters concerning the health, safety and welfare of persons on the site.

8.7 Waste

8.7.1 Details of how material should be classified for waste disposal are presented in Appendix F.

8.7.2 Waste Acceptance Criteria (WAC) testing was outside the scope of this investigation and the guidance given below is general.

Waste Classification - Total Concentrations

8.7.3 Based on the total concentrations at the site made ground soils would generally be classified as non-hazardous. Potentially hazardous levels of hydrocarbons were identified within TP22 and this material should be carefully segregated from other made ground soils on the site and a waste assessment undertaken.

Waste Acceptance Criteria

8.7.4 If materials are to be removed from site a detailed waste assessment should be undertaken to determine the most suitable disposal route.

8.7.5 The possibility of automatic inert classification of the natural soils should be explored in accordance with Section 4.3 of the EA guidance document. The Council Decision includes a list of wastes in Section 2.1.1 of the document that are assumed to be inert and therefore acceptable at a landfill for inert waste without testing, this is the case if:

- *They are single stream waste of a single waste type (although different waste types from the list may be accepted together if they are from a single source) and*
- *There is no suspicion of material or substances such as metals, asbestos, plastics, chemicals, etc to an extent which increases the risk associated with the waste sufficiently to justify contamination and they do not contain other their disposal in other classes of landfill.*

General

8.7.6 If any additional gross hydrocarbon contaminated material is encountered during the construction phase, it is possible that this may be classified as hazardous and testing should be undertaken at that time.

8.7.7 Where it is necessary to dispose material off site it is recommended that materials are segregated and where necessary sufficient time is allowed to further classify the material properly, including discussion with landfill sites and waste transfer stations to find the best disposal route.



8.7.8 As a significant proportion of the soils likely to be generated on site are clean it is recommended that where possible that the soils could be recycled at a suitable local waste treatment plant or transfer station rather than a landfill disposal route.

8.7.9 Due to variations in site levels some earthworks or cutting and filling of areas may be undertaken. If the reuse of soils is proposed on the site this should be done in accordance with the CL:AIRE "Development Industry Code of Practice for the Definition of Waste" (CL:AIRE CoP). Further guidance is provided on this in Appendix G. Any re-use scheme should be designed to minimise disposal costs.

8.8 Compliance

8.8.1 It is recommended that the approval of the Local Authority and the Agency is obtained for to the proposed remedial scheme prior to any irrevocable action being taken.

8.8.2 Once the above bodies have approved the remedial proposals it would be useful to produce a short remediation specification. This will also give guidance to enable a suitably qualified contractor to carry out the works.

9.0 CONCLUSIONS

9.1 Summary

Environmental

- 9.1.1 Localised lead and arsenic contamination marginally in excess of residential screening values was identified within Area A with elevated PAH and hydrocarbon contamination also notified at one location within Area A. The risk to site end users is considered to be moderate to low and will be mitigated by source removal or the implementation of a cover system in gardens and soft landscaping areas.
- 9.1.2 No elevated determinands were identified within Area B and there is no considered risk to site end users from contamination in this area.
- 9.1.3 No asbestos was detected within any of the samples screened across the site.
- 9.1.4 Ground gas monitoring is ongoing and a full assessment will be issued upon completion of the monitoring programme. At present basic ground gas precautionary measures for carbon dioxide are likely to be required within Area A. No elevated concentrations have been identified within Area B to date however a consistent gas regime has not yet been identified.
- 9.1.5 Waste acceptance criteria was beyond the scope of works and should be carried out if material is to be removed from site. Based on total concentrations both made ground and natural soils are non-hazardous with the exception of made ground within TP22 which contains potentially hazardous levels of hydrocarbons.

Geotechnical

- 9.1.6 Foundation recommendations are preliminary at this stage as no development layout or finished site levels are available. Within Area A foundations are likely to be shallow unreinforced strip foundations founding on natural clays or weathered bedrock between 1.20m and 1.50m. Foundations may need to be deepened locally where trees are present in accordance with NHBC Chapter 4.2 or where deeper pockets of made ground exist. It is considered that this will best be achieved by trench or mass fill foundations.
- 9.1.7 Due to the likelihood of ground gas precautionary measures being required within Area A it is recommended that suspended floor slabs are implemented.
- 9.1.8 Within Area B treatment of mine workings is required to prevent subsidence of foundations. The extents of the treatment areas relating to coal seams is unknown at this stage. Following treatment reinforced strip foundations are considered the most suitable solution for the majority of plots within Area B within clays and weathered bedrock at shallow depths are considered suitable founding strata at a depth of between 1.00m and 1.50m within the main field. Within the smaller field in the east where granular strata was encountered foundations should be a minimum depth of 0.60m.
- 9.1.9 Shallow mining such as bell pits were identified locally at the site and within these areas a deeper foundation solution; trench fill or vibro improved ground may be



required in these areas however additional investigation is required to fully assess this risk.

9.1.10 Floor slabs within Area B can be ground bearing in areas where less than 600mm of suitably compacted granular material is present beneath finished floor levels however ground gas monitoring has not yet identified a consistent ground gas regime and therefore the need for suspended floor slabs cannot be ruled out at this stage.

9.1.11 The use of soakaways is not considered feasible at the site due to relatively impermeable strata at shallow depths. However this should be confirmed by in situ testing.

9.2 Further Work

9.2.1 The following further work is considered necessary to progress the site to construction phase:

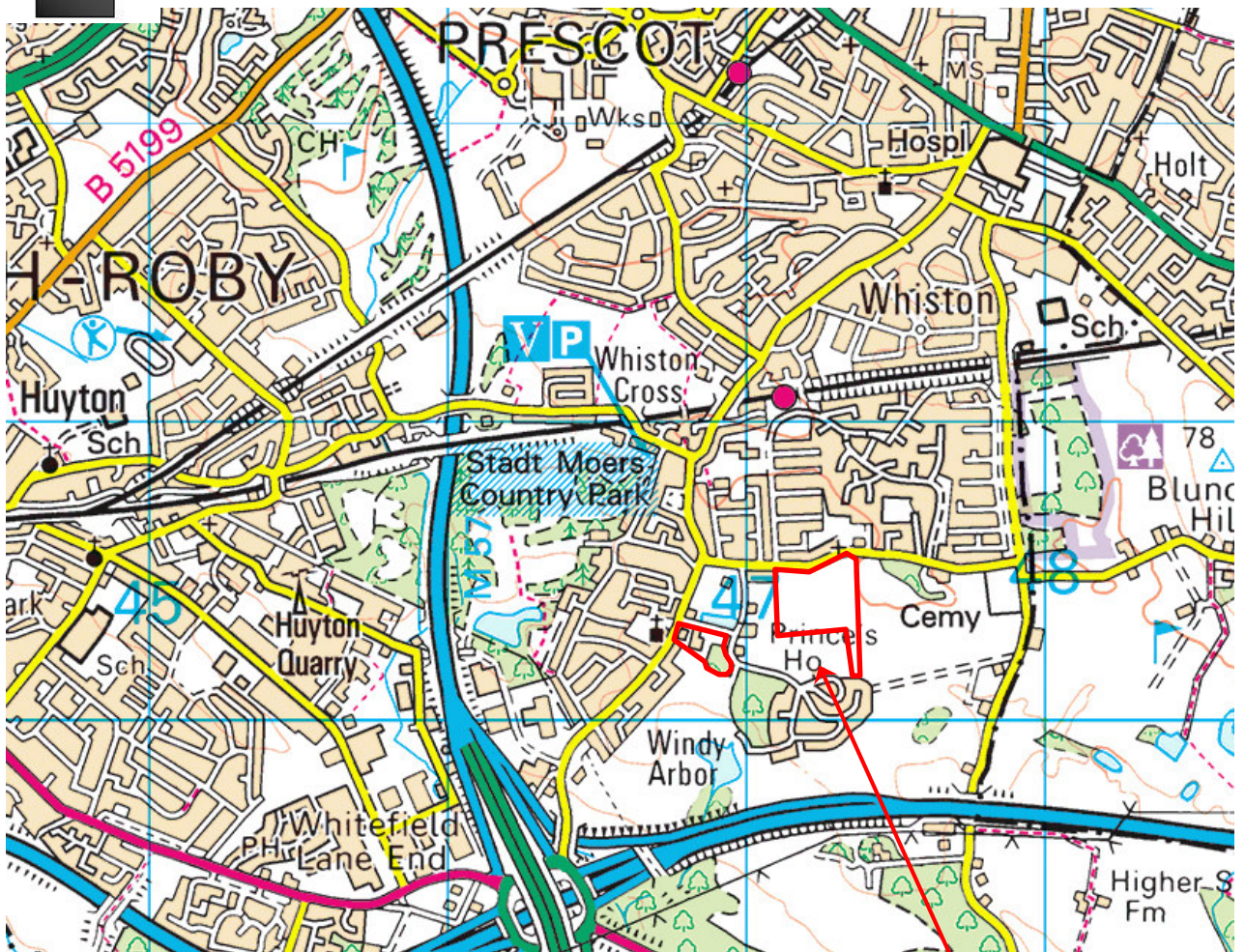
- Completion of gas monitoring programme.
- Issue gas assessment.
- Additional Intrusive site investigations within previously inaccessible areas (Area A)
- Design of remedial strategy.
- Treatment of mine workings and shafts.
- Demolition Asbestos survey.
- Tree survey by qualified arboriculturist.
- Detailed Foundation design.
- Confirmation of Remedial Strategy with Local Authority.

10.0 REFERENCES

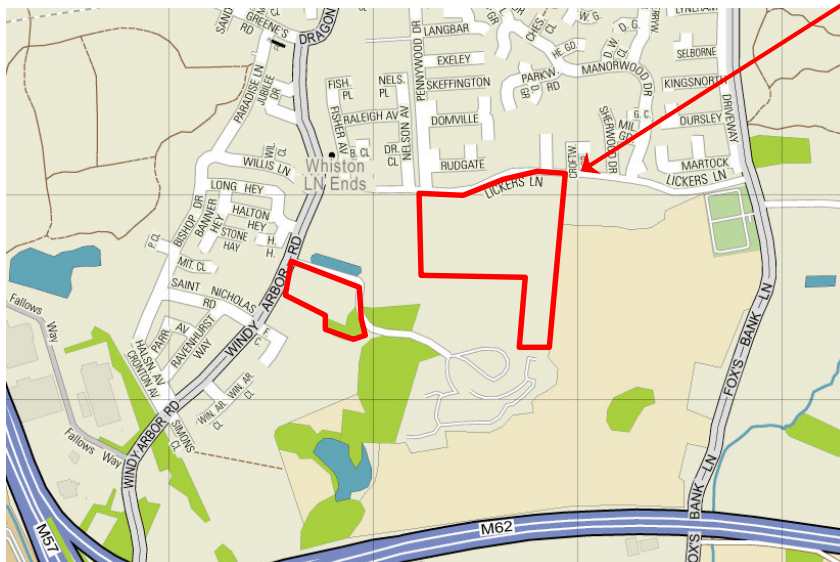
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DRAWINGS



SITE



**BROWNFIELD
SOLUTIONS LTD**
GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

**STEWART MILNE
HOMES**

Halsnead Park, Whiston

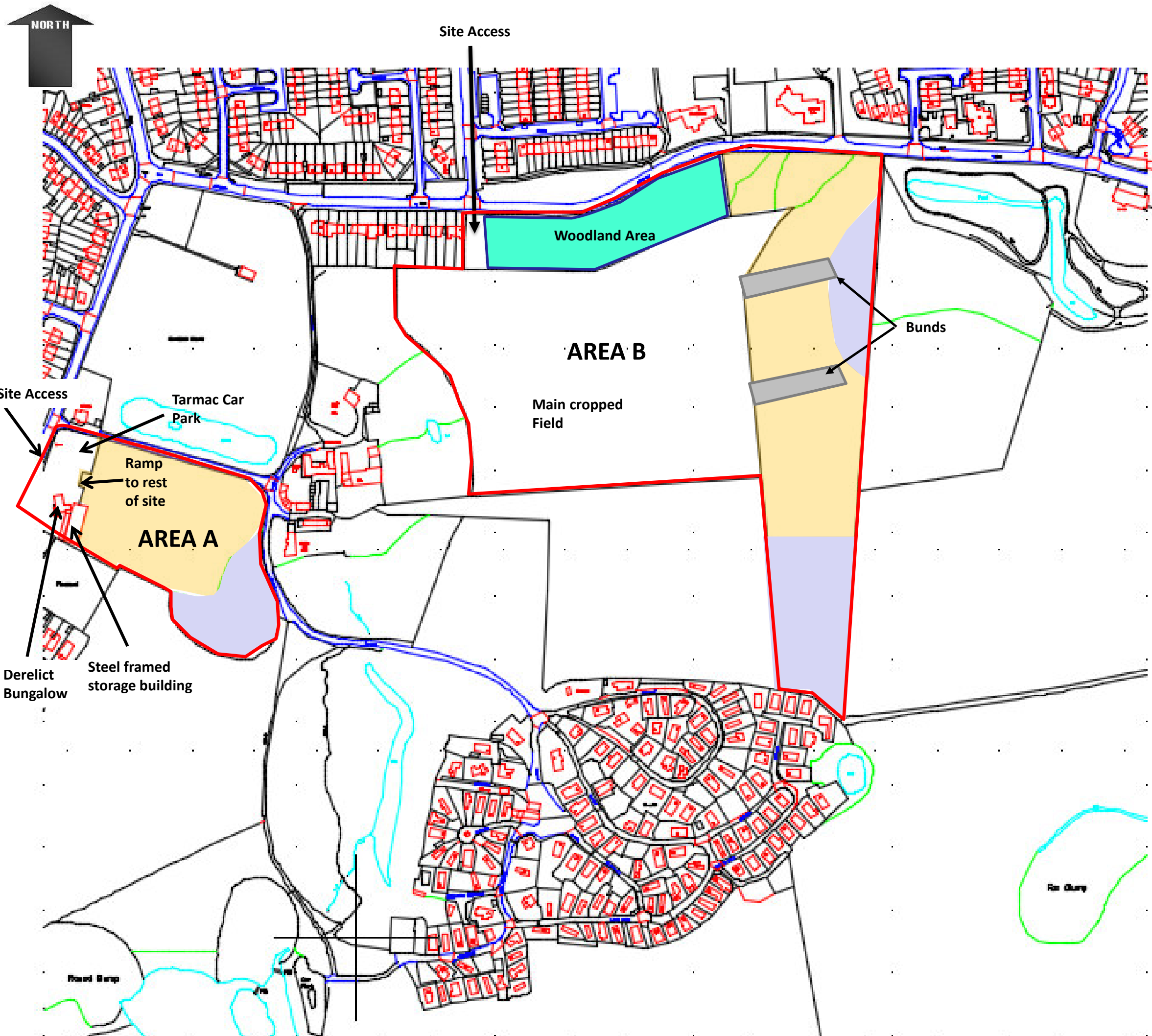
Site Location Plan

Drawing Number C3593/01

Scale: NTS

Drawn By: LC

Checked By: AJH



KEY

- Densely vegetated areas
- Lightly vegetated area



**BROWNFIELD
SOLUTIONS LTD**
CEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

**STEWART MILNE
HOMES**

HALSNEAD PARK, WHISTON

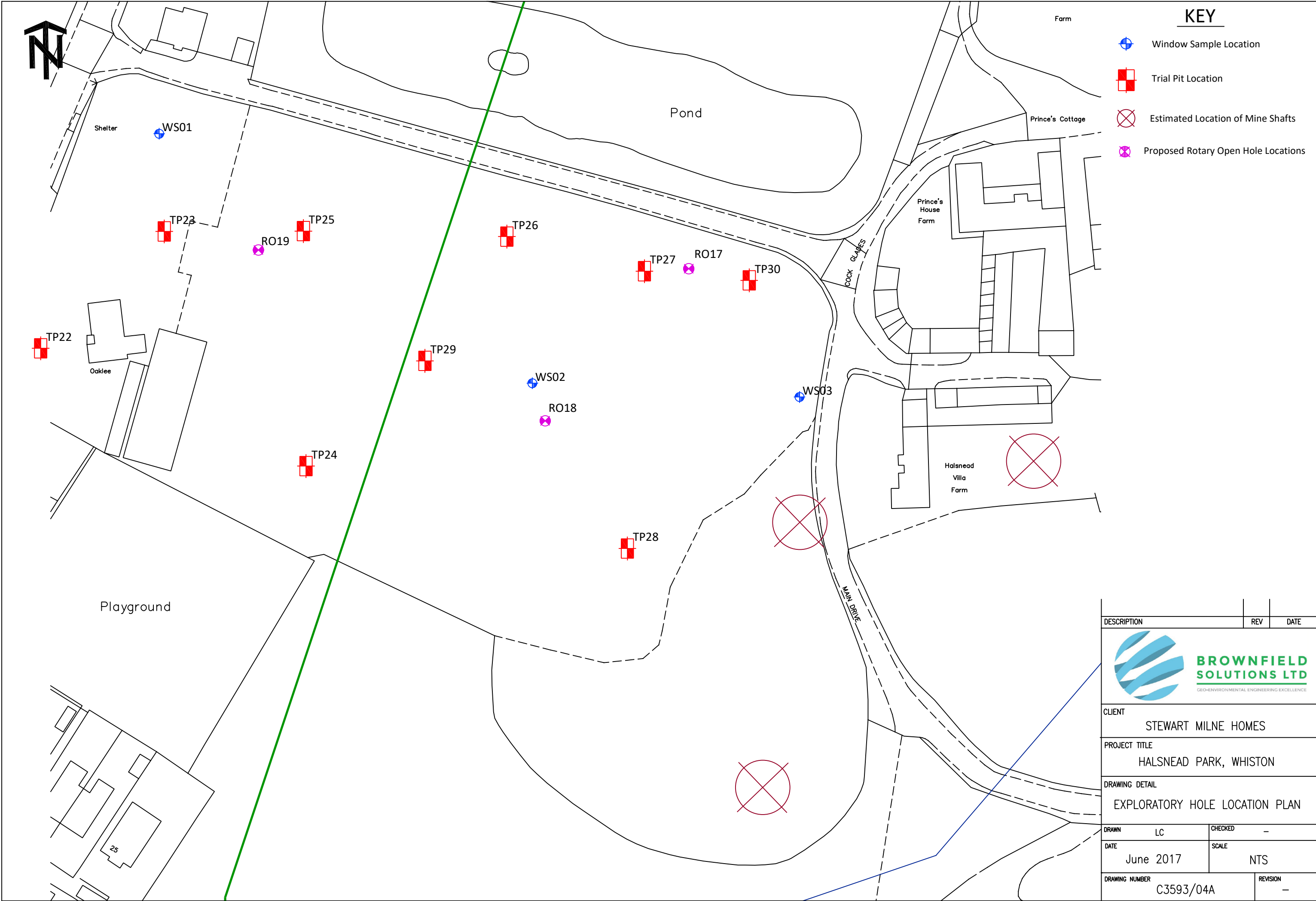
Pertinent Site Features Plan

Drawing No. C3593/02

Scale: NTS

Drawn By: LC

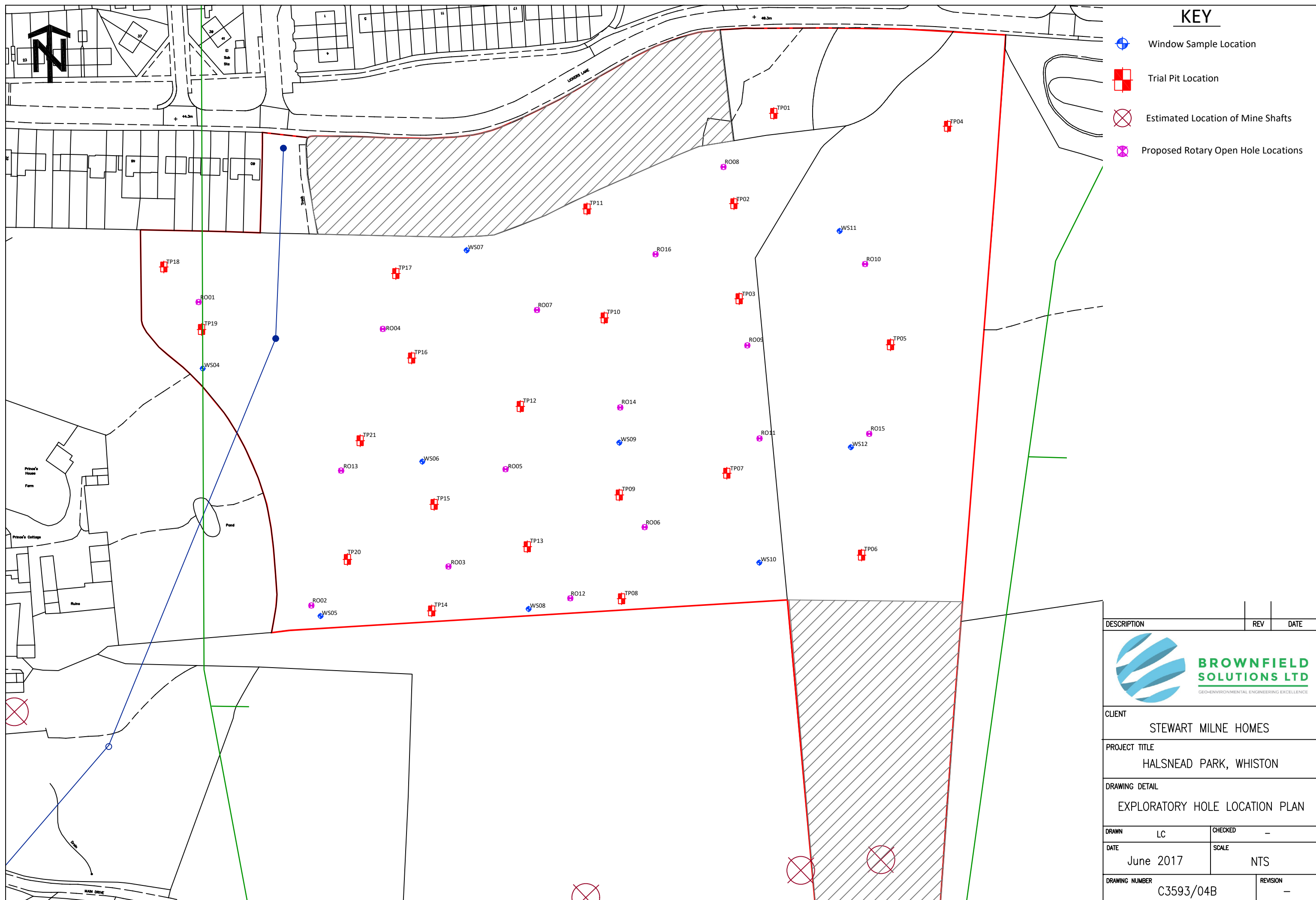
Checked By: AJH



KEY

-  Window Sample Location
-  Trial Pit Location
-  Estimated Location of Mine Shafts
-  Proposed Rotary Open Hole Locations

DESCRIPTION		REV	DATE
 BROWNFIELD SOLUTIONS LTD GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE			
CLIENT		STEWART MILNE HOMES	
PROJECT TITLE		HALSNEAD PARK, WHISTON	
DRAWING DETAIL		EXPLORATORY HOLE LOCATION PLAN	
DRAWN	LC	CHECKED	—
DATE	June 2017	SCALE	NTS
DRAWING NUMBER		REVISION	
C3593/04A		—	





KEY

Window Sample Location

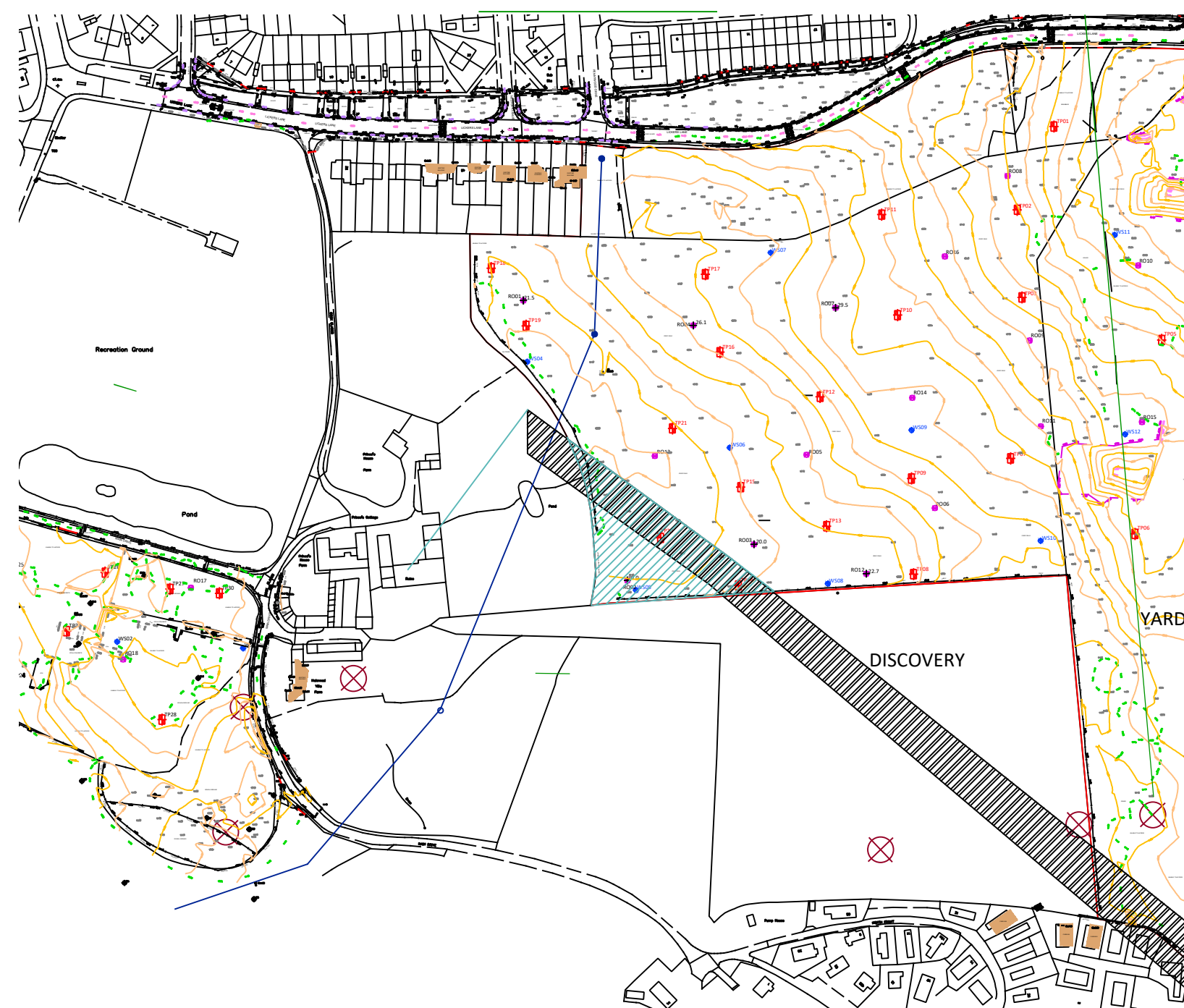
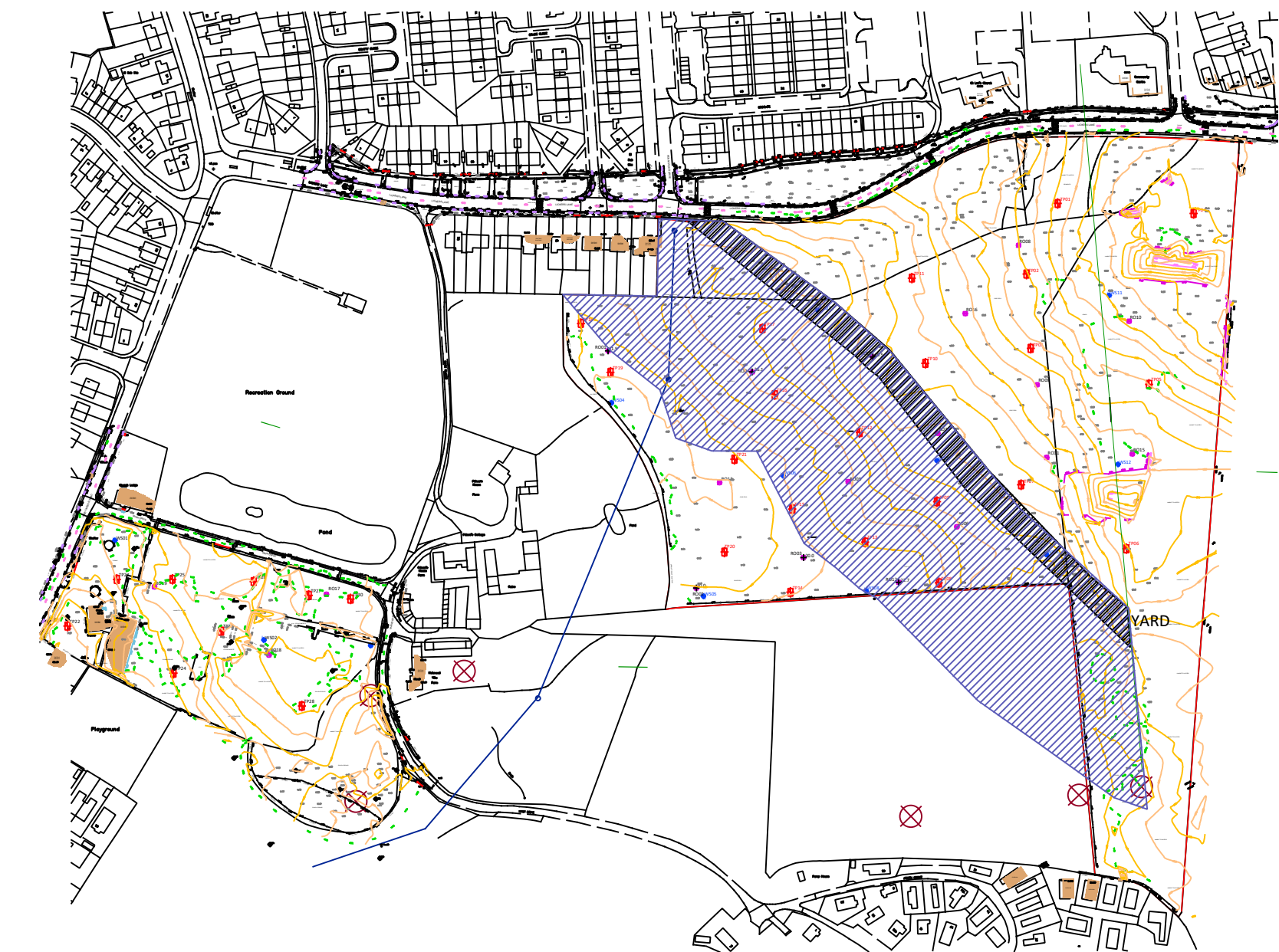
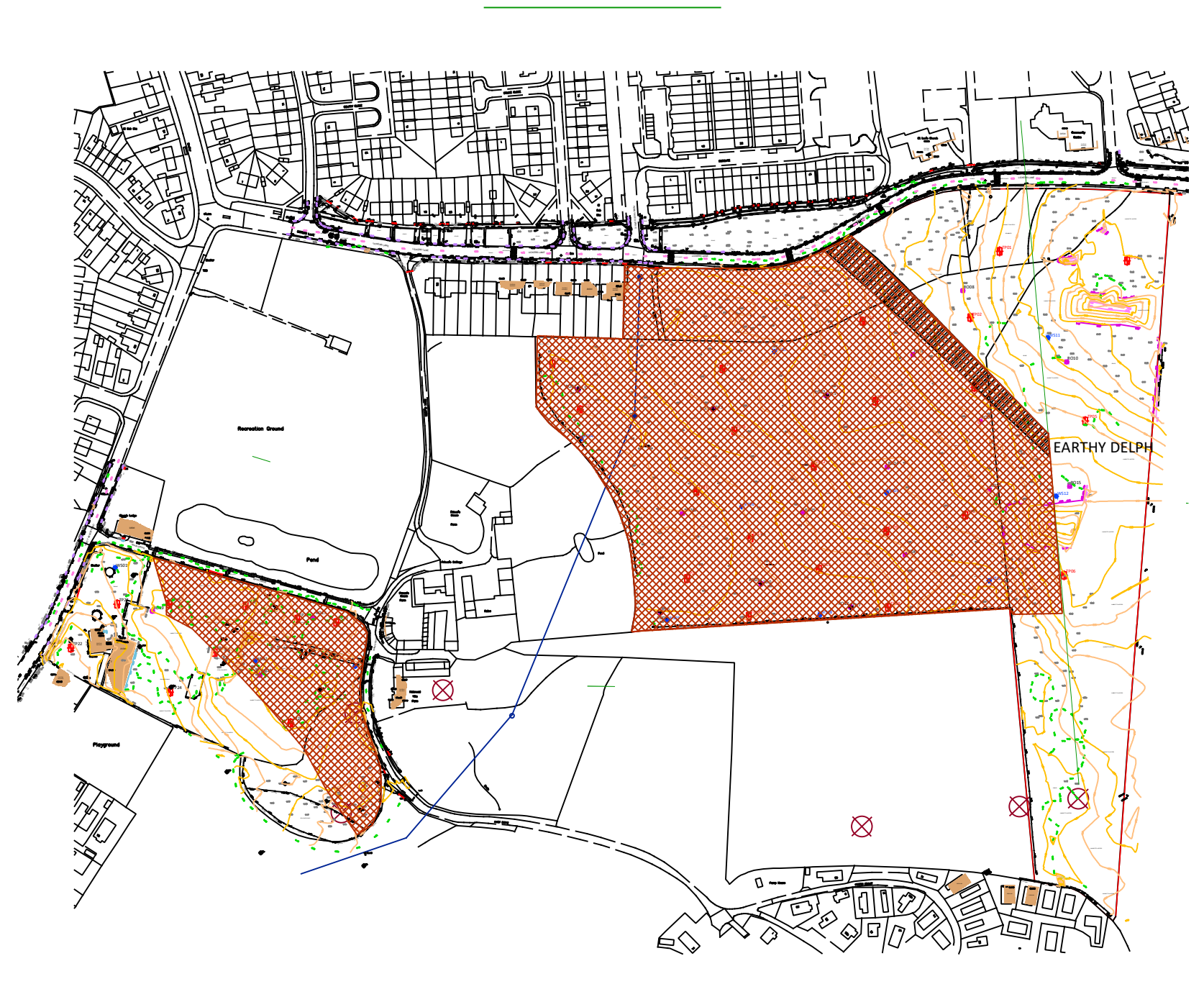
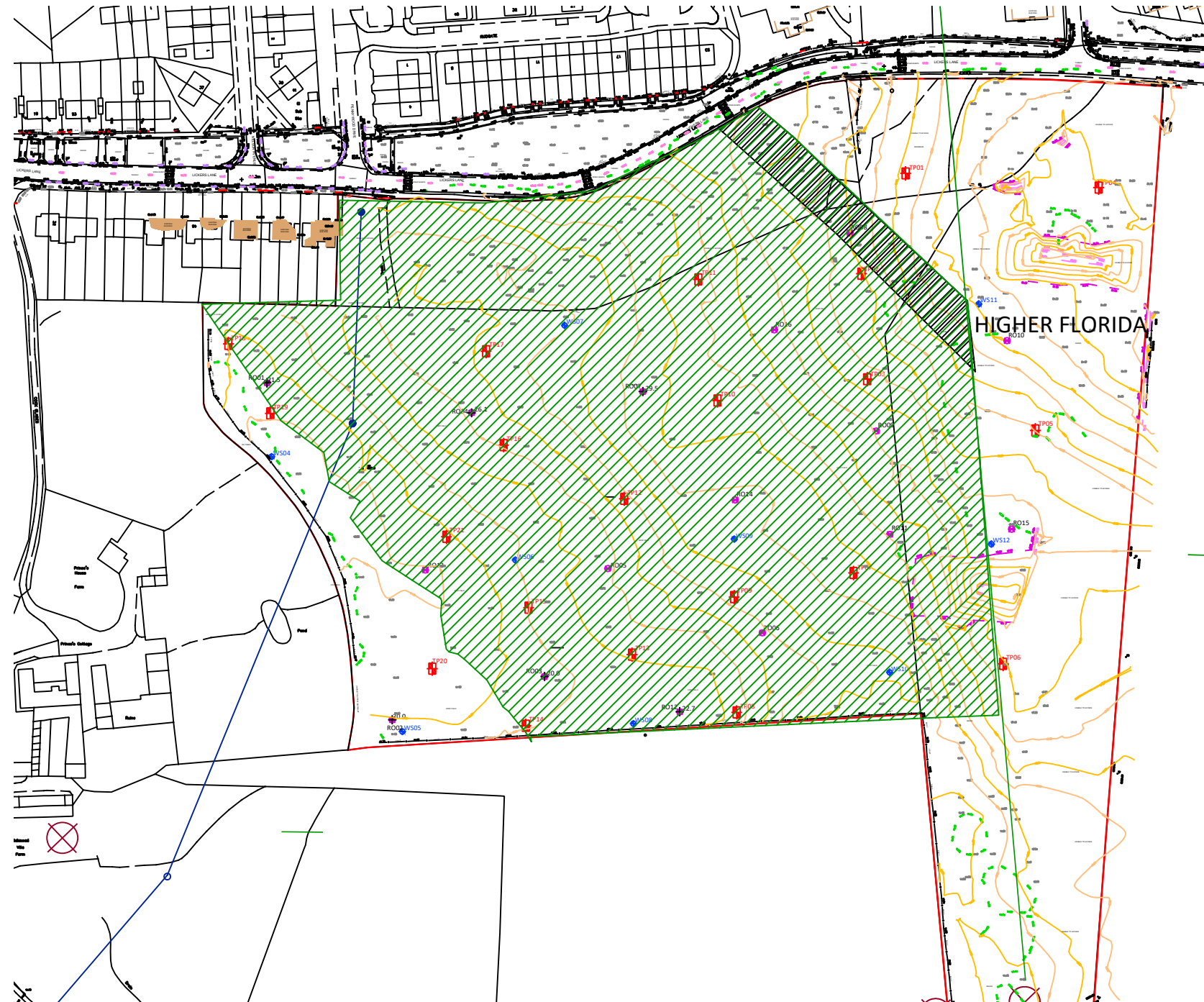
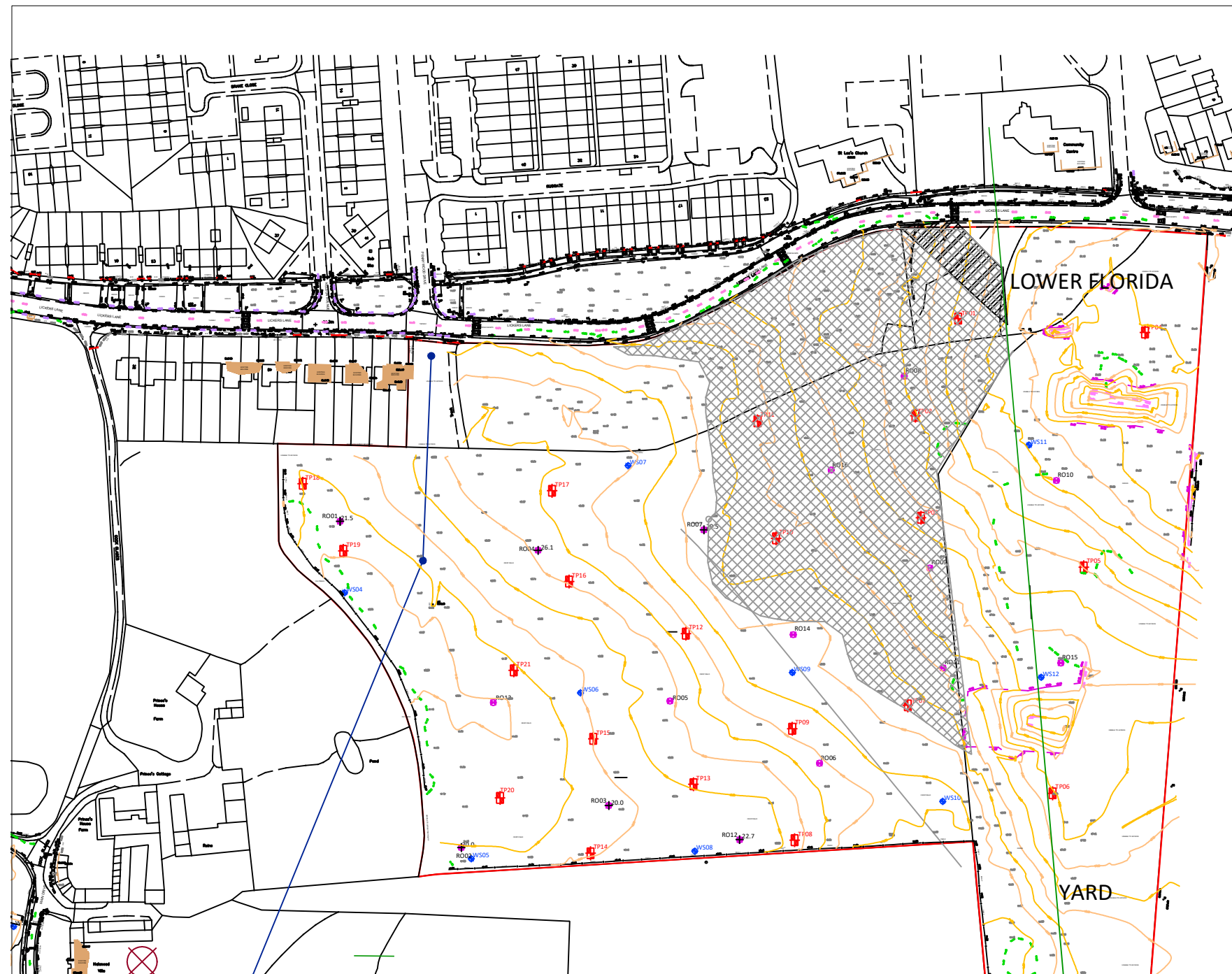
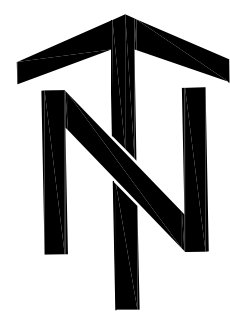
Trial Pit Location

Rotary Open Hole Locations

Postulated subcrops of coal seams based on site investigation

Postulated location of faults on site

DESCRIPTION		REV	DATE
 BROWNFIELD SOLUTIONS LTD GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE			
CLIENT			
STEWART MILNE HOMES			
PROJECT TITLE			
HALSNEAD PARK, WHISTON			
DRAWING DETAIL			
Coal Seam Plan			
DRAWN		LC	CHECKED
			—
DATE		SCALE	
June 2017		NTS	
DRAWING NUMBER			REVISION
C3593/06			—



Zone of influence of each seam is shown as a worst case scenario based on maximum seam thickness and assuming all seams below are worked.

DESCRIPTION	REV	DATE
 BROWNFIELD SOLUTIONS LTD GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE		
CLIENT	STEWART MILNE HOMES	
PROJECT TITLE	HALSNEAD PARK, WHISTON	
DRAWING DETAIL	PLAN SHOWING ZONE OF INFLUENCE AT THE SURFACE FROM COAL SEAMS	
DRAWN	LC	CHECKED AJH
DATE	July 2017	SCALE NTS
DRAWING NUMBER	C3593/07	REVISION —

APPENDIX A

Exploratory Hole Logs



William Smith House,
173-183 Witton Street,
Northwich,
Cheshire,
CW9 5LP

Borehole Log

Borehole No.

WS01

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 346805.10 - 390318.90

Hole Type
WS

Location: WHISTON

Level: 46.82

Scale
1:25

Client: STEWART MILNE HOMES LTD

Dates: 18/05/2017 -

Logged By
LC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.05			0.05	46.77		MADE GROUND: Tarmac.	1
					0.30	46.52		MADE GROUND: Grey subangular medium to coarse gravel of limestone subbase.	
		0.40	ES					MADE GROUND: Soft to firm dark brown black organic clay with occasional fibrous plant matter. Gravel of clinker and brick above 0.60m.	
		0.70	ES					Slight organic odour at 0.70m. Soft and sandy between 0.70m and 0.90m.	
		1.00	D		0.90	45.92		MADE GROUND: Soft to firm brown sandy clay with rare subangular fine to coarse gravel of brick and plastic. Silty below 1.00m.	
		1.00		N=4 (1,1/1,1,1,1)				Damp sand band at 2.25m.	
		1.50	D		1.40	45.42		Stiff orange brown sandy CLAY with coal stringers and sand veins throughout.	
		2.00							
		2.00	D						
				N=8 (2,2/2,2,2,2)					
		2.90	D		2.85	43.97		Very weak orange brown micaceous MUDSTONE highly weathered (recovered as gravelly clay).	3
		3.00							
				36 (6,8/36 for 220mm)					
					3.38	43.44		End of borehole at 3.37 m	4
									5

Remarks

- No groundwater encountered.
- Installation: Plain pipe from ground level to 0.50m, slotted pipe from 0.50m to 1.50m.





William Smith House,
173-183 Witton Street,
Northwich,
Cheshire,
CW9 5LP

Borehole Log

Borehole No.

WS02

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 346887.90 - 390253.00

Hole Type
WS

Location: WHISTON

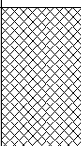
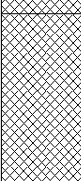
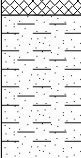
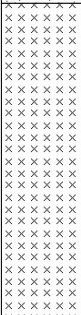
Level: 43.39

Scale
1:25

Client: STEWART MILNE HOMES LTD

Dates: 18/05/2017 -

Logged By
LC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description						
		Depth (m)	Type	Results										
		0.40	ES	N=5 (1,1/1,1,1,2)	0.50	42.89		MADE GROUND: Black red sandy ashy subangular to subrounded fine to coarse gravel of brick and clinker. <u>Clayey above 0.20m.</u>	1					
		0.80	ES		1.10	42.29		MADE GROUND: Soft to firm black grey sandy clay. <u>Band of subangular fine limestone gravel between 0.80m and 0.90m.</u> <u>Small cobble of bitumen bound concrete at 0.90m.</u>						
		1.00	D					Soft grey sandy damp CLAY with occasional coal fragments.						
		1.15												
		1.65	D	N=13 (2,3/3,3,3,4)	1.60	41.79		Stiff to very stiff orange brown sandy CLAY with occasional subrounded fine to medium gravel of mixed lithologies.	2					
		2.00 2.00	D		2.40	40.99								
		2.00				Very weak blue grey micaceous SILTSTONE highly weathered (recovered as laminated gravelly silty clay).								
		3.00 3.00	D		3.45	39.94			3					
		3.00												
								End of borehole at 3.45 m	4					
										5				

Remarks

1. No groundwater encountered.
2. Hole backfilled with arisings upon completion.





William Smith House,
173-183 Witton Street,
Northwich,
Cheshire,
CW9 5LP

Borehole Log

Borehole No.

WS03

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 346953.30 - 390258.00

Hole Type
WS

Location: WHISTON

Level: 43.86

Scale
1:25

Client: STEWART MILNE HOMES LTD

Dates: 18/05/2017 -

Logged By
LC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.50	ES	N=15 (2,3/3,4,4,4)	0.60	43.26		MADE GROUND: Topsoil over black brown ashy sandy subangular fine to coarse gravel of limestone and clinker.	1
		0.70	ES		0.90	42.96		Band of subangular fine limestone gravel between 0.55m and 0.60m.	
		1.00	D					Firm dark brown black sandy CLAY with coal fragments.	
		1.00		N=26 (4,5/5,6,7,8)				Stiff orange brown mottled grey sandy silty CLAY (possible residual bedrock).	2
		1.50	D					Very stiff below 1.50m.	
		2.00	D		2.00	41.86		Very weak orange brown micaceous MUDSTONE with ferrous staining highly weathered (recovered as gravelly clay).	
		2.00		50 (7,9/50 for 285mm)	2.50	41.36		Very weak black inferior COAL highly weathered (recovered as gravel).	3
		2.20	D		2.55	41.31		Very weak orange brown micaceous MUDSTONE with ferrous staining highly weathered (recovered as laminated gravel).	
		3.00	D		3.00	40.86		Very weak grey micaceous SILTSTONE highly weathered (recovered as laminated gravel).	
		3.00			3.44	40.42		End of borehole at 3.44 m	4
									5

Remarks

- No groundwater encountered.
- Installation: Plain pipe from ground level to 1.00m, slotted pipe from 1.00m to 3.00m.





William Smith House,
173-183 Witton Street,
Northwich,
Cheshire,
CW9 5LP

Borehole Log

Borehole No.

WS04

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347092.90 - 390398.60

Hole Type
WS

Location: WHISTON

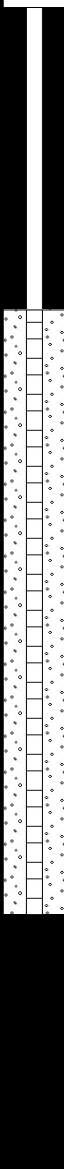
Level: 40.78

Scale
1:25

Client: STEWART MILNE HOMES LTD

Dates: 18/05/2017 -

Logged By
LC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description			
		Depth (m)	Type	Results							
		0.10	ES		0.20	40.58		MADE GROUND: Brown sandy clayey topsoil.	1		
		0.30	ES					MADE GROUND: Stiff to very stiff grey brown sandy clay with fragments of coal and burnt shale. Reworked ground.			
		0.60	D								
		1.00	D	N=8 (1,2/2,2,2,2)	1.85	38.93		Thin coal band between 1.20m and 1.22m.	2		
		1.00									
		1.80	D	N=17 (2,3/4,5,4,4)				Thin coal band between 1.80m and 1.84m.			
		2.00	D					Weak brown orange MUDSTONE weathered (recovered as laminated clayey gravel) with fine grained sandstone bands.			
		2.00						Very weak and highly weathered at 2.00m recovered as clayey gravel.			
		3.00	D	N=6 (1,1/2,1,1,2)	3.85	36.93		Saturated at 2.50m.	3		
		3.00									
		3.40	D	50 (25 for 0mm/50 for 5mm)				Completely weathered clay band at 3.20m.	4		
		3.80						Orange mudstone (possible seat earth) at 3.50m and 3.80m.	5		
								End of borehole at 3.85 m			

Remarks

- Groundwater encountered at 2.50m.
- Installation: Plain pipe from ground level to 1.00m, slotted pipe from 1.00m to 3.80m.





William Smith House,
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Borehole Log

Borehole No.

WS05

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347146.20 - 390286.50

Hole Type
WS

Location: WHISTON

Level: 41.57

Scale
1:25

Client: STEWART MILNE HOMES LTD

Dates: 18/05/2017 -

Logged By
LC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES		0.40	41.17		Brown sandy clayey TOPSOIL with coal fragments.	1
		0.50	ES					Stiff red brown mottled grey slightly sandy CLAY with occasional subrounded fine to coarse gravel of mixed lithologies.	
		1.00 1.00	D	N=8 (1,2/2,2,2,2)					
								<i>Damp below 1.75m.</i>	
		2.00 2.00	D	N=9 (1,2/2,2,2,3)	2.50	39.07			
		2.55	D					Very weak grey SILTSTONE highly weathered (recovered as blocky clayey gravel with occasional carbonaceous lenses and rare plant matter).	
		3.00 3.00	D	50 (7,10/50 for 295mm)					
					3.44	38.13		End of borehole at 3.44 m	5

Remarks

1. No groundwater encountered.
2. Hole backfilled with arisings upon completion.





William Smith House,
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Borehole Log

Borehole No.

WS06

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347192.30 - 390356.30

Hole Type
WS

Location: WHISTON

Level: 42.24

Scale
1:25

Client: STEWART MILNE HOMES LTD

Dates: 18/05/2017 -

Logged By
LC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES	N=11 (2,2/2,3,3,3)	0.30	41.94		Brown sandy clayey TOPSOIL with coal fragments.	
		0.50	ES					Stiff to very stiff orange brown sandy CLAY.	
		1.00	D					Coal lenses below 1.00m.	
		1.00	D					Thin dull coal band between 1.20m and 1.22m.	
		1.20	D	N=9 (1,2/2,2,2,3)				Sand band between 1.35m and 1.40m.	
		2.00	D					Damp below 2.00m.	
		2.00	D						
		2.80			2.70	39.54		Weak light grey fine grained SANDSTONE/ SILTSTONE weathered (recovered as slightly sandy gravel with micaceous grains and laminated in parts).	
				50 (28 for 15mm/50 for 55mm)	2.87	39.37		End of borehole at 2.87 m	

Remarks

1. No groundwater encountered.
2. Hole backfilled with arisings upon completion.





William Smith House,
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Borehole Log

Borehole No.

WS07

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347212.40 - 390452.20

Hole Type
WS

Location: WHISTON

Level: 43.99

Scale
1:25

Client: STEWART MILNE HOMES LTD

Dates: 18/05/2017 -

Logged By
LC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
		0.20	ES	N=11 (2,2/2,3,3,3)	0.40	43.59		Brown sandy clayey TOPSOIL with coal fragments.	1	
		0.50	ES					Firm to stiff orange brown mottled grey sandy CLAY.		
		1.00	D		1.00	42.99		Very stiff light orange grey CLAY with frequent coal gravel.		
		1.20	D							
		1.60	D	50 (7,8/50 for 285mm)	1.75	42.24		Grey with abundant coal below 1.60m (Possible completely weathered coal).	2	
		1.80	D					Very weak black COAL highly weathered, dull with minor bright bands and carbonaceous mudstone bands (recovered as gravel).		
		1.90	D		2.34	41.65				
		1.90								
								End of borehole at 2.34 m	3	
									4	
									5	

Remarks

1. No groundwater encountered.
2. Installation: Plain pipe from ground level to 0.50m, slotted pipe from 0.50m to 2.30m.





William Smith House,
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Borehole Log

Borehole No.

WS08

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347240.60 - 390289.70

Hole Type
WS

Location: WHISTON

Level: 42.23

Scale
1:25

Client: STEWART MILNE HOMES LTD

Dates: 19/05/2017 -

Logged By
LC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES		0.40	41.83		Brown sandy clayey TOPSOIL.	1
		0.50	D					Stiff red brown mottled grey slightly sandy CLAY with occasional coal fragments.	
		1.00 1.00	D	N=14 (3,3/3,3,3,5)				<u>Damp sand bands below 1.50m.</u>	
		1.50	D		2.40	39.83		<u>Slightly gravelly below 2.00m.</u>	2
		2.00 2.00	D	N=16 (2,2/3,3,5,5)				Very weak grey blue SILTSTONE highly weathered (recovered as clayey gravel).	
		2.90 2.90	D	50 (25 for 85mm/50 for 75mm)				<u>Ferrous staining below 2.70m.</u>	
					3.06	39.17		End of borehole at 3.06 m	3
									4
									5

Remarks

- No groundwater encountered.
- Installation: Plain pipe from ground level to 1.00m, slotted pipe from 1.00m to 2.90m.





William Smith House,
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Borehole Log

Borehole No.

WS09

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347281.60 - 390365.00

Hole Type
WS

Location: WHISTON

Level: 44.94

Scale
1:25

Client: STEWART MILNE HOMES LTD

Dates: 19/05/2017 -

Logged By
LC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30	ES		0.40	44.54		Brown sandy clayey TOPSOIL.	1
		1.00 1.00	ES	N=12 (3,3/3,3,3,3)				Stiff orange brown sandy CLAY with occasional subangular to subrounded fine to medium gravel of coal and siltstone.	
		1.60	D		2.20	42.74			2
		2.00 2.00	D	50 (5,7/50 for 275mm)					
		2.25	D					Extremely weak orange grey SILTSTONE residually weathered (recovered as gravelly clay).	
		2.50 2.50	D	50 (25 for 105mm/50 for 185mm)				Very weak grey blue SILTSTONE highly weathered (recovered as gravel). <i>Weak and weathered below 2.50m.</i>	
					2.79	42.15		End of borehole at 2.79 m	3
									4
									5

Remarks

1. No groundwater encountered.
2. Hole backfilled with arisings upon completion.





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Borehole Log

Borehole No.

WS10

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347345.00 - 390310.70

Hole Type
WS

Location: WHISTON

Level: 44.48

Scale
1:25

Client: STEWART MILNE HOMES LTD

Dates: 19/05/2017 -

Logged By
LC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.25	ES	N=7 (1,1/2,2,1,2)	0.20	44.28		MADE GROUND: Brown sandy clayey topsoil.	1
		0.75	ES					MADE GROUND: Stiff brown grey ashy sandy gravelly clay. Gravel is subangular to subrounded fine to coarse of coal, burnt shale and other mixed lithologies (reworked ground).	
		1.00	D						
		1.00	D						
		1.30	D	N=15 (5,3/4,3,4,4)	1.20	43.28		Soft to firm dark grey slightly sandy gravelly CLAY. Gravel is subangular to subrounded fine to medium of coal.	2
					1.60	42.88		Firm brown grey sandy CLAY with occasional subangular fine to medium gravel of mudstone and siltstone.	
		2.00	D		1.90	42.58		Very weak blue grey micaceous SILTSTONE highly weathered (recovered as clayey gravel). Completely weathered saturated clay band between 2.00m and 2.50m.	
		2.00	D						
		2.80	D	50 (8,10/50 for 175mm)				Weak and weathered below 2.60m.	3
		3.00	D						
					3.33	41.15		End of borehole at 3.33 m	4
									5

Remarks

- No groundwater encountered.
- Installation: Plain pipe from ground level to 1.00m, slotted pipe from 1.00m to 3.00m.





William Smith House,
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Borehole Log

Borehole No.

WS11

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347381.40 - 390460.90

Hole Type
WS

Location: WHISTON

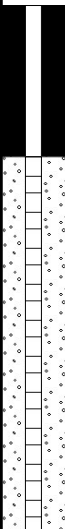
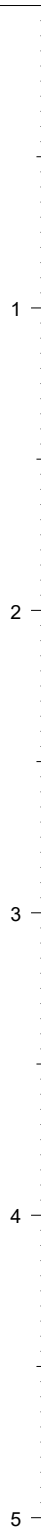
Level: 50.78

Scale
1:25

Client: STEWART MILNE HOMES LTD

Dates: 19/05/2017 -

Logged By
LC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.20	50.58		Dark brown clayey sandy TOPSOIL.	
		0.30	ES					Very stiff orange brown slightly sandy CLAY with occasional subangular to subrounded fine to coarse gravel of mixed lithologies including coal and siltstone.	
		0.50	D						
		1.00	D		1.00	49.78		Dense red brown saturated slightly clayey fine to coarse SAND.	
		1.50	D		1.30	49.48		Very dense light brown cream silty fine SAND (possible residual bedrock).	
		1.67	D		1.68	49.10			
								End of borehole at 1.75 m	

Remarks

1. No groundwater encountered.
2. Installation: Plain pipe from ground level to 0.50m, slotted pipe from 0.50m to 1.68m.



Borehole Log

Borehole No.

WS12

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347386.50 - 390363.00

Hole Type	WS
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
12	12
13	13
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93	93
94	94
95	95
96	96
97	97
98	98
99	99
100	100

Location: WHISTON

Level: 47.62

Scale
1:25

Client: STEWART MILNE HOMES LTD

Dates: 19/05/2017 -

Logged By
LC

[illegible]

Remarks

1. No groundwater encountered.
2. Installation: Plain pipe from ground level to 0.50m, slotted pipe from 0.50m to 1.13m.





William Smith House,
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Trial Pit Log

Trialpit No

TP01

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347351.50 - 390514.20
Level: 46.99

Date
22/05/2017

Location: WHISTON

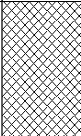
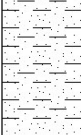
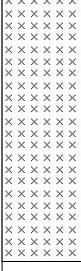
Dimensions
(m):

Depth
4.10

Scale
1:25

Logged
LC

Client: STEWART MILNE HOMES LTD

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.25	ES		0.45	46.54		MADE GROUND: Dark brown black clayey sandy topsoil with abundant roots and occasional subangular to subrounded fine to coarse gravel of brick and rare plastic and clinker.	1
	0.50	ES					Brown clayey silty fine to coarse SAND with rare gravel.	
	1.00	D		1.00	45.99		Stiff to very stiff orange brown sandy friable CLAY with abundant sand bands.	
							<u>Coal fragments below 1.50m.</u>	2
	2.35	D		2.30	44.69		Very weak black dark grey COAL dull with bright bands highly weathered interbedded with thin partings of carbonaceous mudstone (recovered as gravel).	3
	3.25	D		3.20	43.79		<u>Sulphur odour noted at base of seam.</u> Very weak grey SILTSTONE highly weathered (recovered as clayey sand and gravel).	4
				4.10	42.89		<u>End of pit at 4.10 m</u>	5

Remarks: 1. Groundwater encountered at 2.30m.

Stability: Sides Stable.





William Smith House,
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CW9 5LP

Trial Pit Log

Trialpit No

TP02

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347333.50 - 390473.30
Level: 48.46

Date
22/05/2017

Location: WHISTON

Dimensions
(m):

Depth
4.00

Scale
1:25

Logged
LC

Client: STEWART MILNE HOMES LTD

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.30	ES		0.40	48.06		MADE GROUND: Compacted brown sandy clayey topsoil with rare pottery fragments.	1
	0.50	ES					MADE GROUND: Brown mottled black red sandy gravelly clay. Gravel is subangular to subrounded fine to coarse of mixed lithologies including coal, sandstone, siltstone and with rare glass.	
	0.85	D		0.80	47.66		Stiff red orange very sandy friable CLAY, clayey sand in parts.	
	1.90	D		1.90	46.56		Very stiff dark brown slightly sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse of mixed lithologies including mudstone and siltstone.	2
	2.90	D		2.70	45.76		Very weak grey SILTSTONE highly weathered (recovered as sand and gravel) with thin coal and carbonaceous bands. <i>Becoming carbonaceous siltstone below 3.20m.</i>	3
	4.00	D		4.00	44.46		End of pit at 4.00 m	4
								5

Remarks: 1. Slow groundwater seepage encountered at 1.80m.

Stability: Sides Stable.





William Smith House,
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Trial Pit Log

Trialpit No

TP03

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347335.80 - 390430.20
Level: 47.75

Date
22/05/2017

Location: WHISTON

Dimensions
(m):

Depth
3.90

Scale
1:25

Logged
LC

Client: STEWART MILNE HOMES LTD

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.35	ES		0.40	47.35		MADE GROUND: Dark brown black clayey sandy topsoil with abundant roots and occasional subangular to subrounded fine to coarse gravel of brick and rare plastic and clinker.	1
	0.50	ES					Firm orange brown slightly sandy CLAY.	
	0.80	D						
	1.25	D		1.20	46.55		Very weak black COAL dull with bright bands highly weathered (recovered as gravel).	2
	2.30	D					Coal with thin red laminated mudstone partings below 2.00m.	
							Coal recovered as cobbles and gravel below 2.80m.	
	3.50	D		3.70	44.05		Moderately weak dark grey carbonaceous SILTSTONE slightly weathered (recovered as flaggy gravel and cobbles).	3
				3.90	43.85		End of pit at 3.90 m	4
								5

Remarks: 1. No groundwater encountered.

Stability: Sides Stable.





William Smith House,
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Trial Pit Log

Trialpit No

TP04

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347430.30 - 390508.30
Level: 51.62

Date
22/05/2017

Location: WHISTON

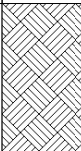
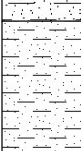
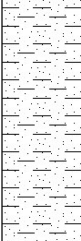
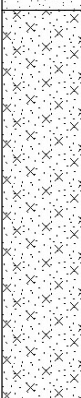
Dimensions
(m):

Depth
3.70

Scale
1:25

Logged
LC

Client: STEWART MILNE HOMES LTD

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.25	ES					Dark brown clayey sandy TOPSOIL with roots and rootlets.	
	0.55	ES		0.50	51.12		Orange brown slightly clayey fine to coarse SAND with rare subrounded fine gravel.	1
	0.80	D					Stiff orange brown slightly gravelly very sandy CLAY with bands of clayey sand. Gravel is subangular to subrounded fine to coarse gravel of mixed lithologies.	
	1.20	D		1.10	50.52		Very stiff below 2.00m.	2
	2.50	D		2.40	49.22		Orange slightly silty fine to medium SAND (completely weathered sandstone).	3
	3.60	D		3.70	47.92		End of pit at 3.70 m	4
								5

Remarks: 1. No groundwater encountered.

Stability: Sides Stable.





William Smith House,
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Cheshire,
CW9 5LP

Trial Pit Log

Trialpit No

TP05

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347404.50 - 390409.40
Level: 48.85

Date
22/05/2017

Location: WHISTON

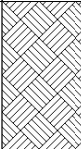
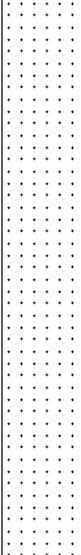
Dimensions
(m):

Depth
2.65

Scale
1:25

Logged
LC

Client: STEWART MILNE HOMES LTD

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.30	ES					Dark brown slightly clayey sandy TOPSOIL.	
	0.55 0.60	ES D		0.50	48.35		Orange brown fine to coarse SAND with occasional subrounded to subangular fine to coarse gravel of weathered sandstone. (Completely weathered bedrock).	
				0.80	48.05		Very weak orange brown fine to medium grained SANDSTONE highly weathered (recovered as silty sand and gravel).	1
	1.50	D						
	2.30	D					Recovered as fine to coarse gravel below 2.00m.	2
				2.65	46.20		End of pit at 2.65 m	3
								4
								5

Remarks: 1. No groundwater encountered.
2. Hole terminated at 2.65m due to no progress on bedrock.

Stability: Sides Stable.





William Smith House,
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Cheshire,
CW9 5LP

Trial Pit Log

Trialpit No

TP06

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347391.30 - 390314.10
Level: 47.66

Date
23/05/2017

Location: WHISTON

Dimensions
(m):

Depth
2.20

Scale
1:25

Logged
LC

Client: STEWART MILNE HOMES LTD

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	ES	HVP=59	0.30	47.36		Dark brown clayey sandy TOPSOIL.	
	0.50	ES					Very stiff brown sandy gravelly friable CLAY. Gravel is subangular to subrounded fine to coarse of mixed lithologies including sandstone and mudstone.	
	0.60	D		0.75	46.91		Clay of medium strength at 0.65m.	
	1.00	D					Very weak yellow cream fine to medium grained SANDSTONE highly weathered (recovered as fine to medium sand and poorly cemented gravel).	1
	2.00	D		2.20	45.46		Band of orange brown fine to coarse weathered sandstone between 1.80m and 2.00m.	2
							Becoming weak and weathered below 2.00m.	
							End of pit at 2.20 m	
								3
								4
								5

Remarks: 1. No groundwater encountered.
2. Hole terminated at 2.20m due to difficult excavation.

Stability: Sides Stable.





William Smith House,
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CW9 5LP

Trial Pit Log

Trialpit No

TP07

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347330.30 - 390351.20
Level: 45.43

Date
23/05/2017

Location: WHISTON

Dimensions
(m):

Depth
3.40

Scale
1:25

Logged
LC

Client: STEWART MILNE HOMES LTD

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
			HVP=119	0.30	45.13		Dark brown clayey sandy TOPSOIL.	
	0.40 0.50	ES D					Stiff red brown mottled grey very sandy CLAY with occasional subangular to subrounded fine to coarse gravel of mixed lithologies.	
							<u>Clay of high strength at 0.70m.</u>	1
	1.50	D					<u>Very friable with damp grey sand bands below 1.45m.</u>	2
	2.35	D		2.30	43.13		Very weak orange brown mottled grey MUDSTONE highly weathered (recovered as clayey gravel and cobbles).	
				2.50	42.93		Very weak grey SILTSTONE highly weathered (recovered as flaggy gravel and cobbles).	
							<u>Carbonaceous siltstone below 2.80m.</u>	
	3.00	D					<u>Completely weathered clay band between 2.90m and 3.00m.</u>	3
				3.40	42.03		End of pit at 3.40 m	4
								5

Remarks: 1. No groundwater encountered.

Stability: Sides Stable.





William Smith House,
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Trial Pit Log

Trialpit No

TP08

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347282.50 - 390294.30
Level: 42.73

Date
23/05/2017

Location: WHISTON

Dimensions
(m):

Depth
3.30

Scale
1:25

Logged
LC

Client: STEWART MILNE HOMES LTD

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	ES					MADE GROUND: Dark brown clayey sandy topsoil.	
	0.50	ES		0.40	42.32		MADE GROUND: Brown orange gravelly very sandy clay with pockets of clayey sand. Gravel is subangular fine to coarse of coal and seatearth. (Strata appears unordered and possibly reworked).	1
	1.50	D		1.20	41.52		Orange brown clayey silty fine to medium SAND (damp).	2
	1.75	D						
	2.30	D		2.25	40.48		Very weak grey SILTSTONE highly weathered (recovered as clayey gravel).	
	2.90	D		2.85	39.88		Weak dark grey carbonaceous SILTSTONE with iron banding and coal stringers weathered (recovered as gravel and cobbles).	3
	3.15	D		3.10	39.62		Moderately weak black COAL bright with iridescent lustre partially weathered to fresh (recovered as gravel and small cobbles).	
				3.30	39.42		End of pit at 3.30 m	4
								5

Remarks: 1. No groundwater encountered.
2. Hole terminated at 3.30m due to no progress on coal.

Stability: Sides Stable.





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Trial Pit Log

Trialpit No

TP09

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347281.60 - 390341.40
Level: 44.26

Date
23/05/2017

Location: WHISTON

Dimensions
(m):

Depth
3.80

Scale
1:25

Logged
LC

Client: STEWART MILNE HOMES LTD

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.30	ES	HVP=117	0.40	43.86		MADE GROUND: Dark brown clayey sandy topsoil.	1
	0.50	ES		0.50	43.76		MADE GROUND: Band of black brown reworked coal and mudstone gravel running north to south across pit. <i>Band of reworked coal and mudstone gravel running north to south across pit between 0.40m and 0.50m.</i>	
	0.70	D					Stiff to very stiff orange brown mottled grey sandy CLAY with occasional subrounded fine to medium gravel of mixed lithologies. <i>Clay of high strength at 0.90m.</i>	
				1.20	43.06		Orange brown slightly clayey silty fine to medium SAND.	
				1.50	42.76		Stiff red brown slightly gravelly sandy CLAY with clayey sand bands. Gravel is subangular to subrounded fine to coarse of mudstone. (Possible residual bedrock).	
	1.80	D		1.75	42.51		Very weak grey SILTSTONE highly weathered with ferrous banding (recovered as clayey gravel).	2
	2.00	D					<i>Moderately weak band between 2.10m and 2.15m.</i>	
	2.80	D		2.70	41.56		Moderately weak black COAL bright with iridescent lustre partially weathered to fresh (recovered as gravel and small cobbles).	3
							<i>Carbonaceous siltstone bands below 3.50m.</i>	
	3.80	D		3.80	40.46		End of pit at 3.80 m	4
								5

Remarks: 1. No groundwater encountered.

Stability: Sides Stable.





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Trial Pit Log

Trialpit No

TP10

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347274.80 - 390421.60
Level: 45.70

Date
23/05/2017

Location: WHISTON

Dimensions
(m):

Depth
3.30

Scale
1:25

Logged
LC

Client: STEWART MILNE HOMES LTD

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	ES	HVP=60	0.30	45.40		MADE GROUND: Dark brown sandy clayey topsoil.	
	0.50	ES		0.50	45.20		MADE GROUND: Stiff orange brown sandy clay with sand bands.	
	0.75	D					Very stiff orange brown sandy CLAY with sand bands. <i>Land drain at 0.50m.</i>	
							<i>Clay of medium strength at 0.75m.</i>	1
	1.70	D	HVP=111	1.50	44.20		Very stiff grey brown slightly sandy CLAY with occasional subangular fine to medium mudstone gravel and micaceous grains. <i>Clay of high strength at 1.70m.</i>	
	2.05	D					<i>Stiff blue grey clay with rare fibrous plant matter at 2.00m.</i>	2
	2.25	D		2.20	43.50		Very weak to weak blue grey MUDSTONE highly weathered to weathered (recovered as clayey gravel and small cobbles).	
				3.00	42.70		Moderately weak grey SILTSTONE with ferrous staining and coal stringers weathered (recovered as gravel and cobbles)	3
				3.30	42.40		End of pit at 3.30 m	4
								5

Remarks: 1. No groundwater encountered.

Stability: Sides Stable.





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Trial Pit Log

Trialpit No

TP11

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347266.90 - 390470.90
Level: 45.83

Date
23/05/2017

Location: WHISTON

Dimensions
(m):

Depth
2.30

Scale
1:25

Logged
LC

Client: STEWART MILNE HOMES LTD

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	ES	HVP=140	0.60	45.23		Dark brown clayey sandy TOPSOIL with coal fragments.	1
	0.65 0.70	ES D					Stiff to very stiff brown orange mottled grey slightly sandy CLAY. <u>Clay of high strength at 0.90m.</u> <u>Becoming red orange at 1.30m.</u>	
							Residually weathered orange grey SILTSTONE (recovered as gravelly clay).	
	2.00	D		1.50	44.33		Weak orange grey fine grained SANDSTONE with thin siltstone bands and coal stringers weathered (recovered as sandy gravel). <u>Recovered as flaggy gravel and cobbles below 2.20m.</u>	2
				1.70	44.13			
				2.30	43.53		End of pit at 2.30 m	3
								4
								5

Remarks: 1. No groundwater encountered.
2. Hole terminated at 2.30m due to no progress on bedrock.

Stability: Sides Stable.





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Trial Pit Log

Trialpit No

TP12

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347236.70 - 390381.40
Level: 43.98

Date
23/05/2017

Location: WHISTON

Dimensions
(m):

Depth
3.40

Scale
1:25

Logged
LC

Client: STEWART MILNE HOMES LTD

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.30	43.68		Dark brown clayey sandy TOPSOIL.	
	0.50 0.60	ES D					Stiff orange brown mottled grey very sandy CLAY, clayey sand in parts.	
	1.00	D		0.95	43.03		Very stiff orange brown mottled grey sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse of mixed lithologies including sandstone and siltstone.	1
	1.80	D		1.70	42.28		Very weak grey SILTSTONE highly weathered (recovered as clayey gravel).	2
	2.60	D					Recovered as gravel and cobbles below 2.40m.	
							Fossil assemblages containing ferns below 3.00m.	3
				3.40	40.58		End of pit at 3.40 m	4
								5

Remarks: 1. No groundwater encountered.

Stability: Sides Stable.





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Trial Pit Log

Trialpit No

TP13

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347239.90 - 390317.90
Level: 42.66

Date
24/05/2017

Location: WHISTON

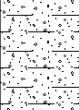
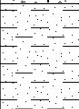
Dimensions
(m):

Depth
3.30

Scale
1:25

Logged
LC

Client: STEWART MILNE HOMES LTD

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description					
	Depth	Type	Results									
	0.40	ES	HVP=61	0.50	42.16		Dark brown clayey sandy TOPSOIL with coal fragments.		1			
		0.60				ES		Light brown slightly gravelly clayey fine to coarse SAND.				
		0.80				D		Very stiff orange brown very sandy friable CLAY.				
	1.15	D		0.90	41.76		<u>Thin coal band at 1.10m.</u>					
							<u>Sandy gravelly clay below 1.20m.</u>					
							<u>Mottled grey below 1.25m.</u>					
	2.15	D		2.70	39.96		<u>Sand band between 2.00m and 2.10m.</u>			2		
							<u>Clay of medium strength at 2.20m.</u>					
						2.80	D	39.36				Very weak orange grey interbedded SILTSTONE and MUDSTONE highly weathered (recovered as gravel).
		<u>Recovered as cobbles and small boulders below 3.00m.</u>		3								
	End of pit at 3.30 m											
												4
											5	

Remarks: 1. No groundwater encountered.

Stability: Sides Stable.





William Smith House,
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Trial Pit Log

Trialpit No

TP14

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347196.50 - 390288.80
Level: 42.08

Date
24/05/2017

Location: WHISTON

Dimensions
(m):

Depth
3.90

Scale
1:25

Logged
LC

Client: STEWART MILNE HOMES LTD

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.45 0.50	ES ES		0.40	41.68		MADE GROUND: Dark brown clayey sandy topsoil with coal fragments.	
	1.00	D					MADE GROUND: Black grey clay bound subangular to subrounded fine to coarse gravel of coal and mudstone. Gravel is erratically ordered and appears reworked. <i>In east of pit natural ground encountered beneath topsoil consisting of orange brown clayey fine to coarse sand becoming stiff orange brown mottled grey clay below 1.00m. Evidence of bell shaped boundary between two stratas on northern pit face.</i>	1
	2.00	D						2
	2.35	D		2.30	39.78		Stiff orange brown slightly sandy slightly gravelly CLAY. Gravel is subangular fine to coarse of siltstone.	3
	3.50	D		3.30	38.78		Very weak grey SILTSTONE highly weathered (recovered as clayey gravel with ferrous staining).	
				3.90	38.18		End of pit at 3.90 m	4
								5

Remarks: 1. No groundwater encountered.

Stability: Sides Stable.





William Smith House,
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Trial Pit Log

Trialpit No

TP15

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347193.70 - 390337.50
Level: 42.10

Date
24/05/2017

Location: WHISTON

Dimensions
(m):

Depth
3.05

Scale
1:25

Logged
LC

Client: STEWART MILNE HOMES LTD

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES	HVP=98	0.30	41.80		MADE GROUND: Dark brown clayey sandy topsoil with mudstone fragments.	
	0.50	ES		0.60	41.50		MADE GROUND: Grey brown clayey subangular to subrounded fine to coarse gravel of weathered coal, mudstone and siltstone (reworked ground).	
	0.70	D					Stiff orange brown mottled grey slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse of mixed lithologies.	
	1.25	D					<u>Fine to coarse sand bands below 1.00m.</u> <u>Clay of high strength at 1.10m.</u>	1
	2.30	D					<u>Becoming very stiff to hard clay below 2.00m.</u>	2
	3.00	D		3.05	39.05		End of pit at 3.05 m	3
								4
								5

Remarks: 1. No groundwater encountered.
2. Hole terminated at 3.05m due to no progress on bedrock.

Stability: Sides Stable.





William Smith House,
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Trial Pit Log

Trialpit No

TP16

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347187.40 - 390403.20
Level: 43.19

Date
24/05/2017

Location: WHISTON

Dimensions
(m):

Depth
3.60

Scale
1:25

Logged
LC

Client: STEWART MILNE HOMES LTD

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.45	ES	HVP=120	0.40	42.79		MADE GROUND: Dark brown clayey sandy topsoil with mudstone fragments.	1
	0.65	ES					MADE GROUND: Black subangular fine to coarse gravel of coal (dull with bright bands) and carbonaceous mudstone in clay matrix. <i>In north of pit strata is an stiff to very stiff orange brown sandy clay. Land drain at 0.70m.</i>	
	1.00	D		1.20	41.99		Stiff to very stiff orange brown mottled grey sandy CLAY with occasional subrounded fine to medium gravel of mixed lithologies. <i>Clay of high strength at 1.50m.</i>	
	1.90	D						2
	2.75	D		3.10	40.09		Very weak grey SILTSTONE highly weathered with weak weathered bands (recovered as blocky clayey gravel).	3
	3.65	D		3.60	39.59		End of pit at 3.60 m	4
								5

Remarks: 1. No groundwater encountered.

Stability: Sides Stable.





William Smith House,
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Trial Pit Log

Trialpit No

TP17

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347180.20 - 390441.60
Level: 43.83

Date
24/05/2017

Location: WHISTON

Dimensions
(m):

Depth
2.50

Scale
1:25

Logged
LC

Client: STEWART MILNE HOMES LTD

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.15	ES	HVP=92				Dark brown clayey sandy TOPSOIL.	
	0.40	ES		0.30	43.53		Brown clayey fine to medium SAND.	
	0.70	D		0.60	43.23		Stiff orange brown sandy CLAY with occasional subangular to subrounded fine to coarse gravel of mixed lithologies. <u>Clay of high strength at 0.90m.</u>	1
	1.60	D		1.50	42.33		Very weak grey SILSTONE highly weathered (recovered as clay and gravel). <u>Micaceous with coal stringers and fossils below 1.80m.</u>	2
				2.50	41.33		End of pit at 2.50 m	3
								4
								5

Remarks: 1. No groundwater encountered.
2. Hole terminated at 2.50m due to no progress on bedrock.

Stability: Sides Stable.





William Smith House,
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Trial Pit Log

Trialpit No

TP18

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347075.30 - 390444.60
Level: 41.58

Date
24/05/2017

Location: WHISTON

Dimensions
(m):

Depth
2.80

Scale
1:25

Logged
LC

Client: STEWART MILNE HOMES LTD

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	ES		0.30	41.28		MADE GROUND: Dark brown clayey sandy topsoil.	
	0.60	ES		0.55	41.03		MADE GROUND: Firm to stiff orange brown mottled grey sandy gravelly clay. Gravel is subangular to subrounded fine to coarse of mixed lithologies.	
	1.30	D					MADE GROUND: Black grey mottled red yellow sandy subangular to subrounded fine to coarse gravel of mudstone, seatearth and sandstone in a sandy clayey matrix (reworked ground).	1
	2.40	D		2.60	38.98		Natural clay encountered at 2.40m in the north of pit.	2
	2.80	D		2.80	38.78		Soft brown sandy CLAY with occasional subangular to subrounded fine to coarse of mixed lithologies.	3
							End of pit at 2.80 m	4
								5

Remarks: 1. Groundwater encountered at 2.70m.
2. Hole terminated at 2.80m due to collapse of pit sides.

Stability: Unstable sides above 2.60m.





William Smith House,
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Trial Pit Log

Trialpit No

TP19

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347092.20 - 390416.30
Level: 41.05

Date
24/05/2017

Location: WHISTON

Dimensions
(m):

Depth
2.55

Scale
1:25

Logged
LC

Client: STEWART MILNE HOMES LTD

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.32	ES		0.30	40.75		MADE GROUND: Dark brown clayey sandy TOPSOIL.
	0.50	D		0.35	40.70		MADE GROUND: Black brown subangular to subrounded fine to coarse gravel of coal and mudstone. Stiff orange brown sandy CLAY, clayey sand in parts.
	1.70	D		2.00	39.05		Very stiff slightly sandy clay below 1.20m.
	2.50	D		2.55	38.50		Extremely weak orange grey MUDSTONE residually weathered (recovered as gravelly clay). Weak and weathered mudstone below 2.40m.
							End of pit at 2.55 m

Remarks: 1. No groundwater encountered.
2. Hole terminated at 2.55m due to no progress on bedrock.

Stability: Sides Stable.





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Trial Pit Log

Trialpit No

TP20

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347158.40 - 390312.10
Level: 41.30

Date
24/05/2017

Location: WHISTON

Dimensions
(m):

Depth
2.70

Scale
1:25

Logged
LC

Client: STEWART MILNE HOMES LTD

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	ES	HVP=70	0.45	40.85		Dark brown clayey sandy TOPSOIL.
	0.50	ES					Stiff orange brown mottled grey sandy CLAY with occasional subangular to subrounded fine to coarse gravel of mixed lithologies. <u>Clay of medium strength at 0.80m.</u>
	0.70	D					
	1.70	D	HVP=110	1.50	39.80		Very stiff orange brown sandy CLAY, clayey sand in parts. <u>Clay of high strength at 1.75m.</u>
	2.65	D					
				2.70	38.60		End of pit at 2.70 m

Remarks: 1. No groundwater encountered.
2. Hole terminated at 2.70 due to no progress on hard strata.

Stability: Sides Stable.





William Smith House,
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Trial Pit Log

Trialpit No

TP21

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347164.20 - 390365.90
Level: 41.60

Date
24/05/2017

Location: WHISTON

Dimensions
(m):

Depth
2.50

Scale
1:25

Logged
LC

Client: STEWART MILNE HOMES LTD

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	ES					Dark brown clayey sandy TOPSOIL.	
	0.50	ES		0.40	41.20		Stiff orange brown mottled grey sandy CLAY with sand bands.	
	0.80	D						
			HVP=90				Clay of high strength at 1.00m.	1
				1.20	40.40		Very stiff orange brown sandy CLAY, clayey sand in parts.	
	1.50	D					Clay of high strength at 1.60m.	
			HVP=112					
				2.00	39.60		Extremely weak red brown MUDSTONE residually weathered (recovered as gravelly clay).	2
	2.20	D						
				2.50	39.10		End of pit at 2.50 m	
								3
								4
								5

Remarks: 1. No groundwater encountered.
2. Hole terminated at 2.50m due to no progress on bedrock.

Stability: Sides Stable





William Smith House,
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Trial Pit Log

Trialpit No

TP22

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 346777.70 - 390269.30
Level: 49.04

Date
25/05/2017

Location: WHISTON

Dimensions
(m):

Depth
2.25

Scale
1:25

Logged
LC

Client: STEWART MILNE HOMES LTD

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10			0.10	48.94		MADE GROUND: Tarmac.	
	0.20			0.20	48.84		MADE GROUND: Grey subangular medium to coarse gravel of limestone subbase.	
	0.45	ES		0.40	48.64		MADE GROUND: Black ashy gravelly fine to coarse sand. Gravel is subangular to subrounded fine to coarse of mixed lithologies including brick, clinker and slag.	
	0.50	D					Hydrocarbon odour at 0.35m. Firm grey orange sandy CLAY. Dark grey black discolouration above 0.50m.	
	1.50	D		1.35	47.69		Extremely weak orange grey SILTSTONE residually weathered (recovered as clayey sand and gravel).	1
	2.00	D		1.85	47.19		Very weak orange grey micaceous SILSTONE highly weathered (recovered as laminated gravel and cobbles).	2
				2.25	46.79		End of pit at 2.25 m	3
								4
								5

Remarks: 1. No groundwater encountered.
2. Hole terminated at 2.25m due to no progress on bedrock.

Stability: Sides Stable.





William Smith House,
173-183 Witton Street,
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Cheshire,
CW9 5LP

Trial Pit Log

Trialpit No

TP23

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 346806.30 - 290296.30
Level: 46.90

Date
25/05/2017

Location: WHISTON

Dimensions
(m):

Depth
2.80

Scale
1:25

Logged
LC

Client: STEWART MILNE HOMES LTD

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10			0.10	46.80		MADE GROUND: Tarmac.	
	0.20			0.20	46.70		MADE GROUND: Grey subangular medium to coarse gravel of limestone subbase.	
	0.45			0.45	46.45		MADE GROUND: Black brown mottled red ashy sandy subangular to subrounded fine to coarse gravel of mixed lithologies including brick, slag and clinker with medium cobble content of brick. Stiff orange brown very sandy CLAY with pockets of very clayey fine to medium sand.	
	1.20			1.20	45.70		Extremely weak light orange brown mottled grey MUDSTONE residually weathered (recovered as friable blocky clay).	1
	2.00			2.00	44.90		Very weak orange brown mottled grey MUDSTONE highly weathered (recovered as laminated gravel and cobbles).	2
	2.80			2.80	44.10		End of pit at 2.80 m	3
								4
								5

Remarks: 1. No groundwater encountered.
2. Hole terminated at 2.80m due to no progress on bedrock.

Stability: Sides Stable.





William Smith House,
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Cheshire,
CW9 5LP

Trial Pit Log

Trialpit No

TP24

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 346839.10 - 390242.00
Level: 46.42

Date
26/05/2017

Location: WHISTON

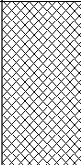
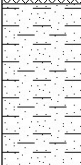
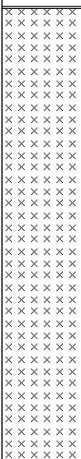
Dimensions
(m):

Depth
3.50

Scale
1:25

Logged
LC

Client: STEWART MILNE HOMES LTD

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.50 0.60	ES ES		0.55	45.87		MADE GROUND: Dark brown sandy clayey gravelly topsoil. Gravel is angular to subangular fine to coarse of brick, glass, plastic ducting, pottery and rope.	
							Very stiff orange brown mottled grey very sandy friable CLAY, clayey sand in parts. (Completely weathered mudstone).	1
	1.20	D		1.10	45.32		Extremely weak light orange brown mottled grey MUDSTONE residually weathered (recovered as laminated clay).	
	2.10	D		2.00	44.42		Very weak dark grey brown SILTSTONE highly weathered (recovered as sandy clayey gravel)	2
	3.40	D		3.50	42.92		End of pit at 3.50 m	3
								4
								5

Remarks: 1. No groundwater encountered.

Stability: Sides Stable.





William Smith House,
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CW9 5LP

Trial Pit Log

Trialpit No

TP25

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 346838.60 - 390296.30
Level: 45.41

Date
26/05/2017

Location: WHISTON

Dimensions
(m):

Depth
2.90

Scale
1:25

Logged
LC

Client: STEWART MILNE HOMES LTD

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.40	ES		0.50	44.91		MADE GROUND: Brown slightly clayey gravelly sandy topsoil. Gravel is angular to subrounded fine to coarse of mixed lithologies including brick, mudstone, terram, glass and rare ash.	1
	0.55	ES					Stiff black sandy organic CLAY.	
	0.75	D						
	1.20	D		1.10	44.31		Very weak dark grey brown SILTSTONE highly weathered (recovered as sandy clayey gravel).	2
				1.90	43.51		Soft orange brown mottled grey sandy CLAY with sand bands with rare siltstone lithorelicts. (Completely weathered siltstone).	
	2.30	D						
	2.60	D		2.60	42.81		Very weak dark grey brown SILTSTONE highly weathered (recovered as sandy clayey gravel).	3
				2.90	42.51		End of pit at 2.90 m	
								4
								5

Remarks: 1. Fast groundwater ingress at 2.00m.
2. Hole terminated at 2.90m due to no progress on hard strata.

Stability: Sides Spalling.



Trial Pit Log

Trialpit No

TP26

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords:	346885.60 - 390295.10
Level:	45.02

Date
26/05/2017

Location: WHISTON

Dimensions
(m):

Scale
1:25

Client: STEWART MILNE HOMES LTD

Depth
1.50

Logged
LC

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.05			0.05	44.97		MADE GROUND: Grey subangular medium to coarse gravel of limestone subbase over terram.
	0.50	ES					MADE GROUND: Brown red sandy subangular fine to coarse gravel of brick, plastic, metal and rare ash with high cobble content of brick.
	1.00	D					
	1.50			1.50	43.52		End of pit at 1.50 m

Remarks:	1. No groundwater encountered. 2. Hole terminated at 1.50m due to very compacted material/concrete slab and complete collapse of sides.
----------	--

Stability: Sides unstable.





William Smith House,
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CW9 5LP

Trial Pit Log

Trialpit No

TP27

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 346917.40 - 390287.10
Level: 43.86

Date
26/05/2017

Location: WHISTON

Dimensions
(m):

Depth
3.10

Scale
1:25

Logged
LC

Client: STEWART MILNE HOMES LTD

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.20	43.66		MADE GROUND: Black grey ashy fine to coarse sand and subangular fine to coarse gravel of limestone subbase with occasional glass, clinker and mudstone gravel.	
	0.50	ES					MADE GROUND: Brown grey gravelly fine to coarse sand with high cobble content. Gravel is angular to subrounded fine to coarse of brick, glass, plastic, metal, concrete and rope. Cobbles are of brick and flagstones. <i>Clayey below 0.50m.</i>	1
				1.20	42.66			
	1.50	D		1.60	42.26		Stiff light orange brown mottled grey sandy CLAY.	
							Stiff orange brown mottled grey sandy friable laminated CLAY with sand bands (Completely weathered siltstone).	2
	2.30	D		2.20	41.66		Extremely weak light orange brown mottled grey SILTSTONE residually weathered (recovered as silty friable laminated clay).	
				2.70	41.16		Very weak orange brown mottled grey SILTSTONE interbedded with thin mudstone bands highly weathered (recovered as flaggy gravel and cobbles).	3
	3.00	D		3.10	40.76		End of pit at 3.10 m	4
								5

Remarks: 1. No groundwater encountered.
2. Hole terminated at 3.10m due to no progress on bedrock.

Stability: Sides unstable above 1.00m.





William Smith House,
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CW9 5LP

Trial Pit Log

Trialpit No

TP28

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 346913.50 - 390222.90
Level: 43.37

Date
26/05/2017

Location: WHISTON

Dimensions
(m):

Depth
2.70

Scale
1:25

Logged
LC

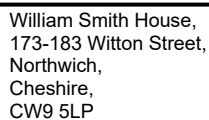
Client: STEWART MILNE HOMES LTD

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	ES		0.30	43.07		MADE GROUND: Moss over dark brown gravelly clayey organic topsoil. Gravel is subangular fine to medium of limestone.	
	0.40	ES		0.50	42.87		Soft black brown sandy CLAY.	
	0.60	D					Grey clayey silty fine to coarse SAND.	
	1.10	D		1.00	42.37		Very stiff red brown mottled grey sandy CLAY with grey sand bands and occasional coal lenses.	1
	2.00	D		1.70	41.67		Very weak grey SILTSTONE highly weathered (recovered as clayey sand and gravel).	
							Recovered as sandy flaggy laminated gravel and cobbles below 2.00m.	2
				2.70	40.67		End of pit at 2.70 m	3
								4
								5

Remarks: 1. No groundwater encountered.
2. Hole terminated at 2.70m due to no progress on bedrock.

Stability: Sides Stable.





Trialpit No

TP29

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords:	346866.60 - 390284.90
Level:	46.82

Date
26/05/2017

Location: WHISTON

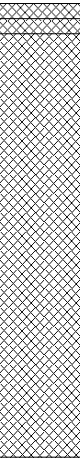
Dimensions
(m):

Scale
1:25

Client: STEWART MILNE HOMES LTD

Depth
1.50

Logged
LC

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
	0.07	ES		0.05 0.10	46.77 46.72		MADE GROUND: Flagstones and grey subangular medium to coarse gravel of limestone subbase over terram.		
	0.50	ES		MADE GROUND: Black grey ashy fine to coarse sand and angular to subangular fine to coarse gravel of brick and limestone.					
	1.00	D		MADE GROUND: Red brown cobbles of brick with much gravelly fine to coarse sand. Gravel is angular to subangular of brick, limestone and other mixed lithologies.					
					1.50	45.32		End of pit at 1.50 m	

Remarks:	1. No groundwater encountered. 2. Hole terminated at 1.50m due to concrete slab.
----------	---

Stability: Sides unstable.





William Smith House,
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CW9 5LP

Trial Pit Log

Trialpit No

TP30

Sheet 1 of 1

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 346941.70 - 39028.90
Level: 45.02

Date
26/05/2017

Location: WHISTON

Dimensions
(m):

Depth
2.50

Scale
1:25

Logged
LC

Client: STEWART MILNE HOMES LTD

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.50	ES		0.10	44.92		MADE GROUND: Black grey ashy sandy subangular fine to coarse gravel of limestone subbase with occasional glass, clinker and mudstone gravel. MADE GROUND: Red brown cobbles of brick with much gravelly ashy fine to coarse sand. Gravel is angular to subangular of brick, limestone, rebar and other mixed lithologies.	1
	1.25	ES		1.20	43.82		Stiff to very stiff orange brown mottled grey sandy CLAY with occasional subrounded fine to medium gravel of mixed lithologies.	
	1.50	D						
	2.30	D		2.00	43.02		Very stiff red brown silty friable CLAY with occasional subrounded fine to coarse gravel of mixed lithologies.	2
				2.50	42.52	End of pit at 2.50 m		
								3
								4
								5

Remarks: 1. No groundwater encountered.
2. Hole terminated at 2.50m due to unstable and collapsing sides.

Stability: Sides collapsing from surface.





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Cheshire,
CW9 5LP

Borehole Log

Borehole No.

R001

Sheet 1 of 3

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347091.00 - 390428.00

Hole Type
RO

Location: WHISTON

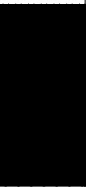
Level: 41.37

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 13/06/2017 -

Logged By
DRILLER

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					3.50	37.87		FILL/SAND/WEAK LIGHT BROWN CLAY (OVERBURDEN).	1
								GREY SILTSTONE.	2
					7.50	33.87		WEAK COAL.	3
					8.70	32.67		GREY SILTSTONE/MUDSTONE.	4
								Continued on next sheet	5

Remarks

1. Drilled using water flush techniques.





Borehole Log

Borehole No.

R001

Sheet 3 of 3

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347091.00 - 390428.00

Hole Type
RO

Location: WHISTON

Level: 41.37

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 13/06/2017 -

Logged By
DRILLER

[illegible]

Remarks

1. Drilled using water flush techniques.





William Smith House,
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CW9 5LP

Borehole Log

Borehole No.

R002

Sheet 1 of 3

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347142.00 - 390291.20

Hole Type
RO

Location: WHISTON

Level: 41.51

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 13/06/2017 -

Logged By
DRILLER

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					3.00	38.51		FILL AND WEAK BROWN CLAY (OVERBURDEN).	1
								GREY SILTSTONE.	2
									3
									4
									5
									6
									7
									8
									9
									10

Continued on next sheet

Remarks

1. Drilled using water flush techniques.



Borehole Log

Borehole No.

RO02

Sheet 2 of 3

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347142.00 - 390291.20

Hole Type
RO

Location: WHISTON

Level: 41.51

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 13/06/2017 -

Logged By
DRILLER

[illegible]

Remarks

1. Drilled using water flush techniques.







William Smith House,
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Cheshire,
CW9 5LP

Borehole Log

Borehole No.

R003

Sheet 1 of 4

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347204.20 - 390308.90

Hole Type
RO

Location: WHISTON

Level: 41.94

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 13/06/2017 -

Logged By
DRILLER

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					3.50	38.44		FILL/SAND (OVERBURDEN).	1
					4.50	37.44		WEAK GREY SILTSTONE.	4
								FIRM GREY SILTSTONE.	5
					9.20	32.74		WEAK/SOFT GROUND GREY SILTSTONE WITH TRACES OF COAL (LOSS OF FLUSH REGAINED).	9
								Continued on next sheet	10

Remarks

1. Drilled using water flush techniques.
2. Loss of flush 9.20m to 10.40m bgl. Flush regained below 10.40m.





William Smith House,
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Cheshire,
CW9 5LP

Borehole Log

Borehole No.

R003

Sheet 2 of 4

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347204.20 - 390308.90

Hole Type
RO

Location: WHISTON

Level: 41.94

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 13/06/2017 -

Logged By
DRILLER

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					10.40	31.54		GREY SILTSTONE/MUDSTONE.	11
									12
									13
									14
									15
									16
									17
									18
									19
									20

Continued on next sheet

Remarks

1. Drilled using water flush techniques.
2. Loss of flush 9.20m to 10.40m bgl. Flush regained below 10.40m.



Borehole Log

Borehole No.

R003

Sheet 3 of 4

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347204.20 - 390308.90

Hole Type
RO

Location: WHISTON

Level:	41.94
--------	-------

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 13/06/2017 -

Logged By
DRILLER

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
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Remarks

- Remarks
1. Drilled using water flush techniques.
 2. Loss of flush 9.20m to 10.40m bgl. Flush regained below 10.40m.



Borehole Log

Borehole No.

R003

Sheet 4 of 4

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347204.20 - 390308.90

Hole Type
RO

Location: WHISTON

Level: 41.94

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 13/06/2017 -

Logged By
DRILLER

[illegible]

Remarks

1. Drilled using water flush techniques.
2. Loss of flush 9.20m to 10.40m bgl. Flush regained below 10.40m.





William Smith House,
173-183 Witton Street,
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Cheshire,
CW9 5LP

Borehole Log

Borehole No.

R004

Sheet 1 of 2

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347174.40 - 390416.50

Hole Type
RO

Location: WHISTON

Level: 43.32

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 13/06/2017 -

Logged By
DRILLER

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					4.50	38.82		FILL/SAND/WEAK BROWN CLAY (OVERBURDEN).	1
								GREY SILTSTONE WITH TRACES OF COAL	2
									3
									4
									5
									6
									7
									8
									9
									10

Continued on next sheet

Remarks

1. Drilled using water flush techniques.







William Smith House,
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Cheshire,
CW9 5LP

Borehole Log

Borehole No.

R005

Sheet 1 of 3

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347230.00 - 390353.00

Hole Type
RO

Location: WHISTON

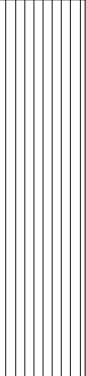
Level: 42.69

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 14/06/2017 -

Logged By
DRILLER

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					3.50	39.19		FILL/SAND/WEAK CLAY (OVERBURDEN).	1
								WEAK GREY SILTSOTNE WITH COAL TRACES (LOST FLUSH BUT REGAINED).	4
					6.00	36.69		FIRM GREY SILTSTONE.	6
								Continued on next sheet	10

Remarks

1. Drilled using water flush techniques.
2. Loss of flush 3.50m to 6.00m. Flush regained below 6.00m.



Borehole Log

Borehole No.

R005

Sheet 2 of 3

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347230.00 - 390353.00

Hole Type
RO

Location: WHISTON

Level: 42.69

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 14/06/2017 -

Logged By
DRILLER

[illegible]

Remarks

- | | |
|---------|--|
| Remarks | <ol style="list-style-type: none"> 1. Drilled using water flush techniques. 2. Loss of flush 3.50m to 6.00m. Flush regained below 6.00m. |
|---------|--|







William Smith House,
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Northwich,
Cheshire,
CW9 5LP

Borehole Log

Borehole No.

R006

Sheet 1 of 2

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347293.10 - 390326.70

Hole Type
RO

Location: WHISTON

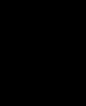
Level: 44.15

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 14/06/2017 -

Logged By
DRILLER

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					3.00	41.15		FILL/SAND (OVERBURDEN).	1
								GREY SILTSTONE.	2
					4.50	39.65		COAL.	3
					5.20	38.95		GREY SILTSTONE.	4
									5
									6
									7
									8
									9
									10

Continued on next sheet

Remarks

1. Drilled using water flush techniques.







William Smith House,
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Cheshire,
CW9 5LP

Borehole Log

Borehole No.

R007

Sheet 1 of 3

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347244.30 - 390425.20

Hole Type
RO

Location: WHISTON

Level: 45.50

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 14/06/2017 -

Logged By
DRILLER

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					2.50	43.00		FILL/WEAK CLAY (OVERBURDEN).	1
									2
								GREY SILTSTONE.	3
									4
									5
									6
									7
									8
									9
									10

Continued on next sheet

Remarks

1. Drilled using water flush techniques.
2. Loss flush from 15.50m bgl.









William Smith House,
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CW9 5LP

Borehole Log

Borehole No.

R008

Sheet 1 of 2

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347328.80 - 390489.90

Hole Type
RO

Location: WHISTON

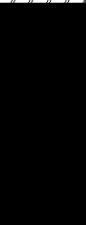
Level: 48.62

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 15/06/2017 -

Logged By
DRILLER

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					1.50	47.12		FILL/WEAK CLAY (OVERBURDEN).	1
					3.00	45.62		COAL.	2
								GREY SILTSTONE WITH SANDSTONE BANDS.	3
					9.50	39.12		BROKEN GROUND.	10
Continued on next sheet									

Remarks

1. Drilled using water flush techniques.
2. Loss of flush from 9.50m bgl.





William Smith House,
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Cheshire,
CW9 5LP

Borehole Log

Borehole No.

R008

Sheet 2 of 2

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347328.80 - 390489.90

Hole Type
RO

Location: WHISTON

Level: 48.62

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 15/06/2017 -

Logged By
DRILLER

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					10.50	38.12		FIRM/HARD DRILLING, LOSS OF FLUSH.	
									11
									12
									13
									14
					15.00	33.62		End of borehole at 15.00 m	15
									16
									17
									18
									19
									20

Remarks

1. Drilled using water flush techniques.
2. Loss of flush from 9.50m bgl.





William Smith House,
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Borehole Log

Borehole No.

R009

Sheet 1 of 2

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347339.60 - 390409.10

Hole Type
RO

Location: WHISTON

Level: 47.10

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 15/06/2017 -

Logged By
DRILLER

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					5.00	42.10		FILL AND WEAK CLAY (OVERBUREDEN).	1
									2
									3
									4
									5
								SOFT/BROKEN GROUND.	6
									7
									8
					9.50	37.60		WEAK DRILLING, LOSS OF FLUSH.	9
									10

Continued on next sheet

Remarks

1. Drilled using water flush techniques.
2. Loss of flush from 5.00m bgl.





William Smith House,
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Cheshire,
CW9 5LP

Borehole Log

Borehole No.

R009

Sheet 2 of 2

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347339.60 - 390409.10

Hole Type
RO

Location: WHISTON

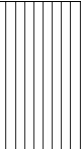
Level: 47.10

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 15/06/2017 -

Logged By
DRILLER

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					11.00	36.10		FIRM HARD DRILLING, LOSS OF FLUSH.	11
									12
									13
									14
					15.00	32.10		End of borehole at 15.00 m	15
									16
									17
									18
									19
									20

Remarks

1. Drilled using water flush techniques.
2. Loss of flush from 5.00m bgl.





William Smith House,
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Borehole Log

Borehole No.

R010

Sheet 1 of 3

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347392.90 - 390445.90

Hole Type
RO

Location: WHISTON

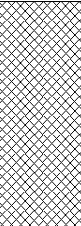
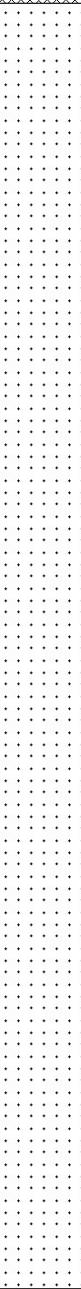
Level: 50.70

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 15/06/2017 -

Logged By
DRILLER

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					1.50	49.20		FILL/WEAK CLAY (OVERBURDEN).	1
								BROWN LIGHT BROWN SANDSTONE.	2
									3
									4
									5
									6
									7
									8
									9
									10

Continued on next sheet

Remarks

1. Drilled using water flush techniques.





William Smith House,
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Borehole Log

Borehole No.

R010

Sheet 2 of 3

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347392.90 - 390445.90

Hole Type
RO

Location: WHISTON

Level: 50.70

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 15/06/2017 -

Logged By
DRILLER

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
									11
									12
									13
									14
									15
									16
									17
									18
									19
									20

Continued on next sheet

Remarks

1. Drilled using water flush techniques.





William Smith House,
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CW9 5LP

Borehole Log

Borehole No.

R010

Sheet 3 of 3

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347392.90 - 390445.90

Hole Type
RO

Location: WHISTON

Level: 50.70

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 15/06/2017 -

Logged By
DRILLER

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					25.00	25.70			21
									22
									23
									24
									25
									26
									27
									28
									29
									30

Remarks

1. Drilled using water flush techniques.





William Smith House,
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Borehole Log

Borehole No.

R011

Sheet 1 of 2

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347345.10 - 390367.00

Hole Type
RO

Location: WHISTON

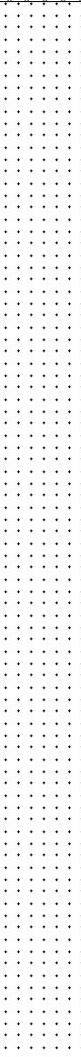
Level: 46.24

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 14/06/2017 -

Logged By
DRILLER

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					2.50	43.74		FILL/LIGHT BROWN CLAY (OVERBURDEN).	1
								LIGHT BROWN SANDTONE.	2
									3
									4
									5
									6
									7
									8
									9
					9.50	36.74		SOFT BROKEN GROUND, LOSS OF FLUSH.	10

Continued on next sheet

Remarks

1. Drilled using water flush techniques.
2. Loss of flush from 9.50m bgl.





William Smith House,
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Borehole Log

Borehole No.

R011

Sheet 2 of 2

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347345.10 - 390367.00

Hole Type
RO

Location: WHISTON

Level: 46.24

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 14/06/2017 -

Logged By
DRILLER

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					12.50	33.74			11
								HARD GROUND, LOSS OF FLUSH.	12
									13
									14
									15
									16
									17
									18
									19
					20.00	26.24		End of borehole at 20.00 m	20

Remarks

1. Drilled using water flush techniques.
2. Loss of flush from 9.50m bgl.





William Smith House,
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Cheshire,
CW9 5LP

Borehole Log

Borehole No.

R012

Sheet 1 of 3

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347259.40 - 390294.50

Hole Type
RO

Location: WHISTON

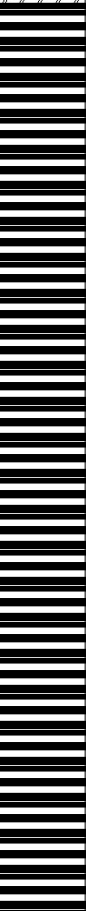
Level: 42.17

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 14/06/2017 -

Logged By
DRILLER

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					4.00	38.17		FILL/SAND (OVERBURDEN).	1
								VERY WEAK GREY SILTSTONE/MUDSTONE AND COAL.	2
									3
									4
									5
									6
									7
									8
									9
									10

Continued on next sheet

Remarks

1. Drilled using water flush techniques.





William Smith House,
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Cheshire,
CW9 5LP

Borehole Log

Borehole No.

R012

Sheet 2 of 3

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347259.40 - 390294.50

Hole Type
RO

Location: WHISTON

Level: 42.17

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 14/06/2017 -

Logged By
DRILLER

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					10.50	31.67		FIRM GREY SILSTONE.	11
									12
									13
									14
									15
									16
									17
					18.30	23.87		COAL.	19
					19.50	22.67		GREY SILTSTONE.	20
								Continued on next sheet	

Remarks

1. Drilled using water flush techniques.







William Smith House,
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CW9 5LP

Borehole Log

Borehole No.

R013

Sheet 1 of 4

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347155.60 - 390352.40

Hole Type
RO

Location: WHISTON

Level: 41.05

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 13/06/2017 -

Logged By
DRILLER

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					3.50	37.55		FILL/SAND (OVERBURDEN).	1
								DARK GREY SILTSTONE WITH TRACES OF COAL	4
					6.00	35.05		GREY SILTSTONE.	6
								Continued on next sheet	10

Remarks

1. Drilled using water flush techniques.





William Smith House,
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Northwich,
Cheshire,
CW9 5LP

Borehole Log

Borehole No.

R013

Sheet 2 of 4

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347155.60 - 390352.40

Hole Type
RO

Location: WHISTON

Level: 41.05

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 13/06/2017 -

Logged By
DRILLER

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					10.40	30.65		WEAK GREY SILTSTONE AND COAL.	11
					11.60	29.45		GREY SILTSTONE/MUDSTONE.	12
									13
									14
									15
									16
									17
									18
									19
									20

Continued on next sheet

Remarks

1. Drilled using water flush techniques.



Borehole Log

Borehole No.

R013

Sheet 3 of 4

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347155.60 - 390352.40

Hole Type
RO

Location: WHISTON

Level:	41.05
--------	-------

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 13/06/2017 -

Logged By
DRILLER

[illegible]

Remarks

1. Drilled using water flush techniques.





Borehole Log

Borehole No.

R014

Sheet 1 of 3

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347281.90 - 390381.00

Hole Type
RO

Location: WHISTON

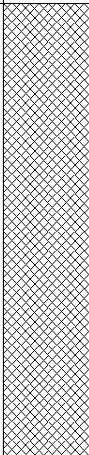
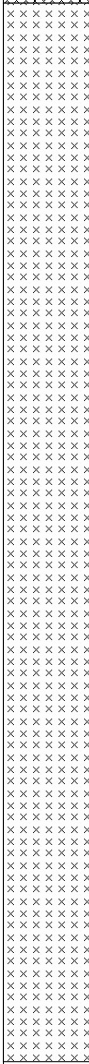
Level:	45.05
--------	-------

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 15/06/2017 -

Logged By
DRILLER

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					3.00	42.04		FILL/CLAY/SANDSTONE (OVERBURDEN).	1
								GREY SILTSTONE WITH SANDSTONE BANDS.	3
									4
									5
									6
									7
									8
									9
									10
									Continued on next sheet

Remarks

1. Drilled using water flush techniques.



Borehole Log

Borehole No.

R014

Sheet 3 of 3

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347281.90 - 390381.00

Hole Type
RO

Location: WHISTON

Level: 45.05

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 15/06/2017 -

Logged By
DRILLER

[illegible]

Remarks

1. Drilled using water flush techniques.





William Smith House,
173-183 Witton Street,
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Borehole Log

Borehole No.

R015

Sheet 1 of 2

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347394.80 - 390369.10

Hole Type
RO

Location: WHISTON

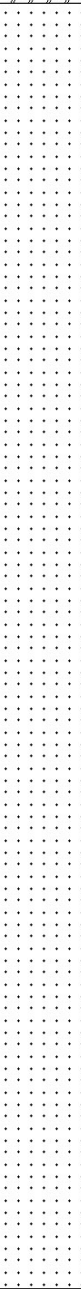
Level: 48.58

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 15/06/2017 -

Logged By
DRILLER

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					1.50	47.08		FILL/WEAK CLAY (OVERBURDEN).	1
								BROWN LIGHT BROWN SANDSTONE.	2
									3
									4
									5
									6
									7
									8
									9
									10

Continued on next sheet

Remarks

1. Drilled using water flush techniques.





William Smith House,
173-183 Witton Street,
Northwich,
Cheshire,
CW9 5LP

Borehole Log

Borehole No.

R015

Sheet 2 of 2

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347394.80 - 390369.10

Hole Type
RO

Location: WHISTON

Level: 48.58

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 15/06/2017 -

Logged By
DRILLER

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					15.00	33.58			
									11
									12
									13
									14
									15
									16
									17
									18
									19
									20

Remarks

1. Drilled using water flush techniques.





William Smith House,
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CW9 5LP

Borehole Log

Borehole No.

R016

Sheet 1 of 2

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347298.00 - 390450.40

Hole Type
RO

Location: WHISTON

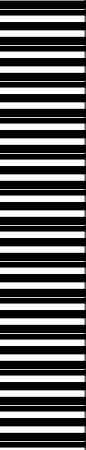
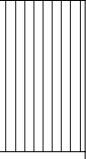
Level: 46.93

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 15/06/2017 -

Logged By
DRILLER

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					3.50	43.43		FILL/WEAK CLAY (OVERBURDEN).	1
								VERY WEAK DARK GREY MUDSTONE AND COAL (LOST AND REGAINED FLUSH).	2
					6.50	40.43		GREY SILTSTONE	3
					9.00	37.93		SOFT/BROKEN GROUND, LOSS OF FLUSH.	4
								Continued on next sheet	5

Remarks

1. Drilled using water flush techniques.
2. Loss of flush from 9.00m bgl.





William Smith House,
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Cheshire,
CW9 5LP

Borehole Log

Borehole No.

R016

Sheet 2 of 2

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 347298.00 - 390450.40

Hole Type
RO

Location: WHISTON

Level: 46.93

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 15/06/2017 -

Logged By
DRILLER

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					10.50	36.43		FIRM/HARD GROUND, LOSS OF FLUSH.	11
									12
									13
					15.00	31.93		End of borehole at 15.00 m	14
									15
									16
									17
									18
									19
									20

Remarks

1. Drilled using water flush techniques.
2. Loss of flush from 9.00m bgl.





William Smith House,
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Borehole Log

Borehole No.

R017

Sheet 1 of 2

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 346927.70 - 390287.60

Hole Type
RO

Location: WHISTON

Level: 43.89

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 16/06/2017 -

Logged By
DRILLER

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					3.50	40.39		FILL/WEAK CLAY (OVERBURDEN).	1
								GREY SILTSTONE AND MUDSTONE.	2
									3
									4
									5
									6
									7
									8
									9
									10

Continued on next sheet

Remarks

1. Drilled using water flush techniques.







William Smith House,
173-183 Witton Street,
Northwich,
Cheshire,
CW9 5LP

Borehole Log

Borehole No.

R018

Sheet 1 of 2

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 346894.50 - 390252.40

Hole Type
RO

Location: WHISTON

Level: 43.43

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 16/06/2017 -

Logged By
DRILLER

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					3.00	40.43		FILL/WEAK CLAY (OVERBURDEN).	1
								GREY SILTSTONE AND MUDSTONE.	2
									3
									4
									5
									6
									7
									8
									9
									10

Continued on next sheet

Remarks

1. Drilled using water flush techniques.







William Smith House,
173-183 Witton Street,
Northwich,
Cheshire,
CW9 5LP

Borehole Log

Borehole No.

R019

Sheet 1 of 2

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 346828.10 - 390292.00

Hole Type
RO

Location: WHISTON

Level: 45.76

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 16/06/2017 -

Logged By
DRILLER

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					3.50	42.26		FILL/SAND/WEAK CLAY (OVERBURDEN).	1
								GREY SILSTONE.	2
									3
									4
									5
									6
									7
									8
									9
									10

Continued on next sheet

Remarks

1. Drilled using water flush techniques.



Borehole Log

Borehole No.

R019

Sheet 2 of 2

Project Name: HALSNEAD PARK

Project No.
C3593

Co-ords: 346828.10 - 390292.00

Hole Type
RO

Location: WHISTON

Level: 45.76

Scale
1:50

Client: STEWART MILNE HOMES LTD

Dates: 16/06/2017 -

Logged By
DRILLER

[illegible]

Remarks

1. Drilled using water flush techniques.



APPENDIX B

Chemical Testing Results



Exova Jones Environmental

Registered Address : Exova (UK) Ltd, Lochend Industrial Estate, Newbridge, Midlothian, EH28 8PL

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

Brownfield Solutions Limited
173-183 Witton Street
Northwich
Cheshire
CW9 5LP

Tel: +44 (0) 1244 833780

Fax: +44 (0) 1244 833781



Attention :	Lucy Crawford
Date :	12th June, 2017
Your reference :	C3593
Our reference :	Test Report 17/9143 Batch 1
Location :	Halsnead Park, Whiston
Date samples received :	24th May, 2017
Status :	Final report
Issue :	1

Thirty two samples were received for analysis on 24th May, 2017 of which ten were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Phil Sommerton BSc
Project Manager

Please see attached notes for all abbreviations and acronyms

Client Name: Brownfield Solutions Limited
Reference: C3593
Location: Halsnead Park, Whiston
Contact: Lucy Crawford
JE Job No.: 17/9143

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	1-3	10-12	19-20	26-28	31-32	48-50	57-59	65-66	67-68	71-73	Please see attached notes for all abbreviations and acronyms		
Sample ID	WS01	WS02	WS04	WS05	WS06	WS10	TP01	TP02	TP03	TP04			
Depth	0.40	0.80	0.10	0.50	0.50	0.75	0.25	0.50	0.35	0.25			
COC No / misc													
Containers	V J T	V J T	V J	V J T	V J	V J T	V J T	V J	V J	V J T			
Sample Date	18/05/2017	18/05/2017	18/05/2017	18/05/2017	18/05/2017	19/05/2017	22/05/2017	22/05/2017	22/05/2017	22/05/2017			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	24/05/2017	24/05/2017	24/05/2017	24/05/2017	24/05/2017	24/05/2017	24/05/2017	24/05/2017	24/05/2017	24/05/2017	LOD/LOR	Units	Method No.
TPH CWG													
Aliphatics													
>C5-C6 #	-	-	-	-	-	-	<0.1	-	-	-	<0.1	mg/kg	TM36/PM12
>C6-C8 #	-	-	-	-	-	-	<0.1	-	-	-	<0.1	mg/kg	TM36/PM12
>C8-C10	-	-	-	-	-	-	<0.1	-	-	-	<0.1	mg/kg	TM36/PM12
>C10-C12 #	-	-	-	-	-	-	<0.2	-	-	-	<0.2	mg/kg	TM5/PM16
>C12-C16 #	-	-	-	-	-	-	<4	-	-	-	<4	mg/kg	TM5/PM16
>C16-C21 #	-	-	-	-	-	-	<7	-	-	-	<7	mg/kg	TM5/PM16
>C21-C35 #	-	-	-	-	-	-	<7	-	-	-	<7	mg/kg	TM5/PM16
Total aliphatics C5-35	-	-	-	-	-	-	<19	-	-	-	<19	mg/kg	TM5/PM16
Aromatics													
>C5-EC7 #	-	-	-	-	-	-	<0.1	-	-	-	<0.1	mg/kg	TM36/PM12
>EC7-EC8 #	-	-	-	-	-	-	<0.1	-	-	-	<0.1	mg/kg	TM36/PM12
>EC8-EC10 #	-	-	-	-	-	-	<0.1	-	-	-	<0.1	mg/kg	TM36/PM12
>EC10-EC12 #	-	-	-	-	-	-	<0.2	-	-	-	<0.2	mg/kg	TM5/PM16
>EC12-EC16 #	-	-	-	-	-	-	<4	-	-	-	<4	mg/kg	TM5/PM16
>EC16-EC21 #	-	-	-	-	-	-	<7	-	-	-	<7	mg/kg	TM5/PM16
>EC21-EC35 #	-	-	-	-	-	-	<7	-	-	-	<7	mg/kg	TM5/PM16
Total aromatics C5-35 #	-	-	-	-	-	-	<19	-	-	-	<19	mg/kg	TM5/PM16
Total aliphatics and aromatics(C5-35)	-	-	-	-	-	-	<38	-	-	-	<38	mg/kg	TM5/PM16
MTBE #	-	-	-	-	-	-	<5	-	-	-	<5	ug/kg	TM31/PM12
Benzene #	-	-	-	-	-	-	<5	-	-	-	<5	ug/kg	TM31/PM12
Toluene #	-	-	-	-	-	-	<5	-	-	-	<5	ug/kg	TM31/PM12
Ethylbenzene #	-	-	-	-	-	-	<5	-	-	-	<5	ug/kg	TM31/PM12
m/p-Xylene #	-	-	-	-	-	-	<5	-	-	-	<5	ug/kg	TM31/PM12
o-Xylene #	-	-	-	-	-	-	<5	-	-	-	<5	ug/kg	TM31/PM12
Total Phenols HPLC	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	mg/kg	TM26/PM21
Natural Moisture Content	19.3	25.7	32.9	29.5	17.5	26.1	31.0	17.2	20.5	18.5	<0.1	%	PM4/PM0
Hexavalent Chromium #	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	0.1015	0.3751	0.0164	0.0182	0.0508	-	0.0087	0.0693	0.0572	0.0134	<0.0015	g/l	TM38/PM20
Free Cyanide	-	-	-	-	-	<0.5	-	-	-	-	<0.5	mg/kg	TM89/PM45
Total Cyanide #	<0.5	<0.5	0.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	mg/kg	TM89/PM45
Organic Matter	30.0	10.8	15.5	1.1	1.7	-	8.4	7.6	124.4	3.7	<0.2	%	TM21/PM24
Sulphide	-	-	-	-	-	<10	-	-	-	-	<10	mg/kg	TM106/PM119
Thiocyanate	-	-	-	-	-	<0.6	-	-	-	-	<0.6	mg/kg	TM107/PM119
pH #	7.88	7.81	7.68	7.85	6.93	7.03	6.90	7.01	6.64	6.35	<0.01	pH units	TM73/PM11

Client Name: Brownfield Solutions Limited
Reference: C3593
Location: Halsnead Park, Whiston
Contact: Lucy Crawford

Note:

Analysis was carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Samples are retained for not less than 6 months from the date of analysis unless specifically requested.

Opinions, including ACM type and Asbestos level, lie outside the scope of our UKAS accreditation.

Where the sample is not taken by a Jones Environmental Laboratory consultant, Jones Environmental Laboratory cannot be responsible for inaccurate or unrepresentative sampling.

Signed on behalf of Jones Environmental Laboratory:

Ryan Butterworth
Asbestos Team Leader

[illegible]

Matrix : Solid

Location: Halsnead Park, Whiston

Contact: Lucy Crawford

[illegible]

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 17/9143

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS) accredited - UK.
SA	ISO17025 (SANAS) accredited - South Africa.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x5 Dilution

JE Job No: 17/9143

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.				
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5/TM36	TM005: Modified USEPA 8015B. Determination of solvent Extractable Petroleum Hydrocarbons (EPH) including column fractionation in the carbon range of C10-35 into aliphatic and aromatic fractions by GC-FID. TM036: Modified USEPA 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C5-10 by headspace GC-FID. Including determination of	PM12/PM16	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis./Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM5/TM36	TM005: Modified USEPA 8015B. Determination of solvent Extractable Petroleum Hydrocarbons (EPH) including column fractionation in the carbon range of C10-35 into aliphatic and aromatic fractions by GC-FID. TM036: Modified USEPA 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C5-10 by headspace GC-FID. Including determination of	PM12/PM16	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis./Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM21	Modified USEPA 415.1. Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO ₂ generated is quantified using infra-red detection.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.			AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21	As received solid or water samples are extracted in Methanol: Sodium Hydroxide (0.1M NaOH) (60:40) by orbital shaker.			AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes

JE Job No: 17/9143

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM31	Modified USEPA 8015B. Determination of Methylterbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	Dried and ground solid sample is boiled with dilute hydrochloric acid, the resulting liquor is then analysed.	Yes		AD	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.			AR	
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM74	Analysis of water soluble boron (20:1 extract) by ICP-OES.	PM32	Hot water soluble boron is extracted from dried and ground samples using a 20:1 ratio.	Yes		AD	Yes

JE Job No: 17/9143

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide and Thiocyanate analysis.			AR	Yes
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide and Thiocyanate analysis.	Yes		AR	Yes
TM106	Determination of Sulphide by Skalar Continuous Flow Analyser	PM119	As received solid samples are extracted with 1M NaOH by orbital shaker for Sulphide and Thiocyanate analysis.			AR	Yes
TM107	Determination of Thiocyanate by Skalar Continuous Flow Analyser	PM119	As received solid samples are extracted with 1M NaOH by orbital shaker for Sulphide and Thiocyanate analysis.			AR	Yes



Exova Jones Environmental

Registered Address : Exova (UK) Ltd, Lochend Industrial Estate, Newbridge, Midlothian, EH28 8PL

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

Brownfield Solutions Limited
173-183 Witton Street
Northwich
Cheshire
CW9 5LP

Tel: +44 (0) 1244 833780

Fax: +44 (0) 1244 833781



Attention :	Lucy Crawford
Date :	6th July, 2017
Your reference :	C3593
Our reference :	Test Report 17/9143 Batch 2
Location :	Halsnead Park, Whiston
Date samples received :	31st May, 2017
Status :	Final report
Issue :	2

Forty five samples were received for analysis on 31st May, 2017 of which twelve were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Bruce Leslie
Project Co-ordinator

Please see attached notes for all abbreviations and acronyms

Client Name: Brownfield Solutions Limited
Reference: C3593
Location: Halsnead Park, Whiston
Contact: Lucy Crawford
JE Job No.: 17/9143

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	98-100	119-121	131-133	137-139	143-145	155-157	164-166	173-175	197-199	200-202	Please see attached notes for all abbreviations and acronyms		
Sample ID	TP09	TP12	TP14	TP15	TP16	TP18	TP20	TP22	TP27	TP27			
Depth	0.30	0.50	0.50	0.50	0.65	0.60	0.50	0.25	0.10	0.50			
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T			
Sample Date	23/05/2017	23/05/2017	24/05/2017	24/05/2017	24/05/2017	24/05/2017	24/05/2017	25/05/2017	26/05/2017	26/05/2017			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	2	2	2	2	2	2	2	2	2	2			
Date of Receipt	31/05/2017	31/05/2017	31/05/2017	31/05/2017	31/05/2017	31/05/2017	31/05/2017	31/05/2017	31/05/2017	31/05/2017	LOD/LOR	Units	Method No.
Pesticides													
Organochlorine Pesticides													
Aldrin	-	-	-	-	-	-	-	-	<100 _{AA}	-	<10	ug/kg	TM42/PM8
Alpha-HCH (BHC)	-	-	-	-	-	-	-	-	<100 _{AA}	-	<10	ug/kg	TM42/PM8
Beta-HCH (BHC)	-	-	-	-	-	-	-	-	<100 _{AA}	-	<10	ug/kg	TM42/PM8
Delta-HCH (BHC)	-	-	-	-	-	-	-	-	<100 _{AA}	-	<10	ug/kg	TM42/PM8
Dieldrin	-	-	-	-	-	-	-	-	<100 _{AA}	-	<10	ug/kg	TM42/PM8
Endosulphan I	-	-	-	-	-	-	-	-	<100 _{AA}	-	<10	ug/kg	TM42/PM8
Endosulphan II	-	-	-	-	-	-	-	-	<100 _{AA}	-	<10	ug/kg	TM42/PM8
Endosulphan sulphate	-	-	-	-	-	-	-	-	<100 _{AA}	-	<10	ug/kg	TM42/PM8
Endrin	-	-	-	-	-	-	-	-	<100 _{AA}	-	<10	ug/kg	TM42/PM8
Gamma-HCH (BHC)	-	-	-	-	-	-	-	-	<100 _{AA}	-	<10	ug/kg	TM42/PM8
Heptachlor	-	-	-	-	-	-	-	-	<100 _{AA}	-	<10	ug/kg	TM42/PM8
Heptachlor Epoxide	-	-	-	-	-	-	-	-	<100 _{AA}	-	<10	ug/kg	TM42/PM8
p,p'-DDE	-	-	-	-	-	-	-	-	<100 _{AA}	-	<10	ug/kg	TM42/PM8
p,p'-DDT	-	-	-	-	-	-	-	-	<100 _{AA}	-	<10	ug/kg	TM42/PM8
p,p'-TDE	-	-	-	-	-	-	-	-	<100 _{AA}	-	<10	ug/kg	TM42/PM8
Total Methoxychlor	-	-	-	-	-	-	-	-	<100 _{AA}	-	<10	ug/kg	TM42/PM8
Organophosphorus Pesticides													
Azinphos methyl	-	-	-	-	-	-	-	-	<100 _{AA}	-	<10	ug/kg	TM42/PM8
Diazinon	-	-	-	-	-	-	-	-	<100 _{AA}	-	<10	ug/kg	TM42/PM8
Dichlorvos	-	-	-	-	-	-	-	-	<100 _{AA}	-	<10	ug/kg	TM42/PM8
Disulfoton	-	-	-	-	-	-	-	-	<100 _{AA}	-	<10	ug/kg	TM42/PM8
Ethion	-	-	-	-	-	-	-	-	<100 _{AA}	-	<10	ug/kg	TM42/PM8
Ethyl Parathion (Parathion)	-	-	-	-	-	-	-	-	<100 _{AA}	-	<10	ug/kg	TM42/PM8
Fenitrothion	-	-	-	-	-	-	-	-	<100 _{AA}	-	<10	ug/kg	TM42/PM8
Malathion	-	-	-	-	-	-	-	-	<100 _{AA}	-	<10	ug/kg	TM42/PM8
Methyl Parathion	-	-	-	-	-	-	-	-	<100 _{AA}	-	<10	ug/kg	TM42/PM8
Mevinphos	-	-	-	-	-	-	-	-	<100 _{AA}	-	<10	ug/kg	TM42/PM8
2,3,6 - TBA	-	-	-	-	-	-	-	-	<1.0 _{AA}	-	<0.1	mg/kg	TM42/PM8
2,4 - D	-	-	-	-	-	-	-	-	<1.0 _{AA}	-	<0.1	mg/kg	TM42/PM8
2,4 - DB	-	-	-	-	-	-	-	-	<1.0 _{AA}	-	<0.1	mg/kg	TM42/PM8
2,4,5 - T	-	-	-	-	-	-	-	-	<1.0 _{AA}	-	<0.1	mg/kg	TM42/PM8
4 - CPA	-	-	-	-	-	-	-	-	<1.0 _{AA}	-	<0.1	mg/kg	TM42/PM8
Benazolin	-	-	-	-	-	-	-	-	<1.0 _{AA}	-	<0.1	mg/kg	TM42/PM8
Bentazone	-	-	-	-	-	-	-	-	<1.0 _{AA}	-	<0.1	mg/kg	TM42/PM8
Bromoxynil	-	-	-	-	-	-	-	-	<1.0 _{AA}	-	<0.1	mg/kg	TM42/PM8
Clopyralid	-	-	-	-	-	-	-	-	<1.0 _{AA}	-	<0.1	mg/kg	TM42/PM8
Dicamba	-	-	-	-	-	-	-	-	<1.0 _{AA}	-	<0.1	mg/kg	TM42/PM8
Dichloroprop	-	-	-	-	-	-	-	-	<1.0 _{AA}	-	<0.1	mg/kg	TM42/PM8
Diclofop	-	-	-	-	-	-	-	-	<1.0 _{AA}	-	<0.1	mg/kg	TM42/PM8
Fenoprop	-	-	-	-	-	-	-	-	<1.0 _{AA}	-	<0.1	mg/kg	TM42/PM8
Flamprop	-	-	-	-	-	-	-	-	<1.0 _{AA}	-	<0.1	mg/kg	TM42/PM8

Please include all sections of this report if it is reproduced

Client Name: Brownfield Solutions Limited
Reference: C3593
Location: Halsnead Park, Whiston
Contact: Lucy Crawford
JE Job No.: 17/9143

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	98-100	119-121	131-133	137-139	143-145	155-157	164-166	173-175	197-199	200-202	Please see attached notes for all abbreviations and acronyms		
Sample ID	TP09	TP12	TP14	TP15	TP16	TP18	TP20	TP22	TP27	TP27			
Depth	0.30	0.50	0.50	0.50	0.65	0.60	0.50	0.25	0.10	0.50			
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T			
Sample Date	23/05/2017	23/05/2017	24/05/2017	24/05/2017	24/05/2017	24/05/2017	24/05/2017	25/05/2017	26/05/2017	26/05/2017			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	2	2	2	2	2	2	2	2	2	2			
Date of Receipt	31/05/2017	31/05/2017	31/05/2017	31/05/2017	31/05/2017	31/05/2017	31/05/2017	31/05/2017	31/05/2017	31/05/2017	LOD/LOR	Units	Method No.
Flamprop – isopropyl	-	-	-	-	-	-	-	-	<1.0 _{AA}	-	<0.1	mg/kg	TM42/PM8
Ioxynil	-	-	-	-	-	-	-	-	<1.0 _{AA}	-	<0.1	mg/kg	TM42/PM8
MCPA	-	-	-	-	-	-	-	-	<1.0 _{AA}	-	<0.1	mg/kg	TM42/PM8
MCPB	-	-	-	-	-	-	-	-	<1.0 _{AA}	-	<0.1	mg/kg	TM42/PM8
Mecoprop	-	-	-	-	-	-	-	-	<1.0 _{AA}	-	<0.1	mg/kg	TM42/PM8
Pentachlorophenol	-	-	-	-	-	-	-	-	<1.0 _{AA}	-	<0.1	mg/kg	TM42/PM8
Picloram	-	-	-	-	-	-	-	-	<1.0 _{AA}	-	<0.1	mg/kg	TM42/PM8
Triclopyr	-	-	-	-	-	-	-	-	<1.0 _{AA}	-	<0.1	mg/kg	TM42/PM8
TPH CWG													
Aliphatics													
>C5-C6 #	-	-	<0.1 _{SV}	-	<0.1 _{SV}	<0.1 _{SV}	-	<0.1 _{SV}	-	-	<0.1	mg/kg	TM36/PM12
>C6-C8 #	-	-	<0.1 _{SV}	-	<0.1 _{SV}	<0.1 _{SV}	-	<0.1 _{SV}	-	-	<0.1	mg/kg	TM36/PM12
>C8-C10	-	-	<0.1 _{SV}	-	<0.1 _{SV}	<0.1 _{SV}	-	<0.1 _{SV}	-	-	<0.1	mg/kg	TM36/PM12
>C10-C12 #	-	-	<0.2	-	5.3	<0.2	-	<0.2	-	-	<0.2	mg/kg	TM5/PM16
>C12-C16 #	-	-	7	-	12	13	-	30	-	-	<4	mg/kg	TM5/PM16
>C16-C21 #	-	-	<7	-	14	19	-	140	-	-	<7	mg/kg	TM5/PM16
>C21-C35 #	-	-	<7	-	<7	27	-	1288	-	-	<7	mg/kg	TM5/PM16
Total aliphatics C5-35	-	-	<19	-	31	59	-	1458	-	-	<19	mg/kg	TM5/PM16/PM12/PM16
Aromatics													
>C5-EC7 #	-	-	<0.1 _{SV}	-	<0.1 _{SV}	<0.1 _{SV}	-	<0.1 _{SV}	-	-	<0.1	mg/kg	TM36/PM12
>EC7-EC8 #	-	-	<0.1 _{SV}	-	<0.1 _{SV}	<0.1 _{SV}	-	<0.1 _{SV}	-	-	<0.1	mg/kg	TM36/PM12
>EC8-EC10 #	-	-	<0.1 _{SV}	-	<0.1 _{SV}	<0.1 _{SV}	-	<0.1 _{SV}	-	-	<0.1	mg/kg	TM36/PM12
>EC10-EC12 #	-	-	<0.2	-	<0.2	<0.2	-	3.2	-	-	<0.2	mg/kg	TM5/PM16
>EC12-EC16 #	-	-	6	-	6	19	-	131	-	-	<4	mg/kg	TM5/PM16
>EC16-EC21 #	-	-	35	-	42	79	-	1772	-	-	<7	mg/kg	TM5/PM16
>EC21-EC35 #	-	-	83	-	88	163	-	6689	-	-	<7	mg/kg	TM5/PM16
Total aromatics C5-35 #	-	-	124	-	136	261	-	8595	-	-	<19	mg/kg	TM5/PM16/PM12/PM16
Total aliphatics and aromatics(C5-35)	-	-	124	-	167	320	-	10053	-	-	<38	mg/kg	TM5/PM16/PM12/PM16
MTBE #	-	-	<5 _{SV}	-	<5 _{SV}	<5 _{SV}	-	<5 _{SV}	-	-	<5	ug/kg	TM31/PM12
Benzene #	-	-	<5 _{SV}	-	<5 _{SV}	<5 _{SV}	-	<5 _{SV}	-	-	<5	ug/kg	TM31/PM12
Toluene #	-	-	<5 _{SV}	-	<5 _{SV}	<5 _{SV}	-	<5 _{SV}	-	-	<5	ug/kg	TM31/PM12
Ethylbenzene #	-	-	<5 _{SV}	-	<5 _{SV}	<5 _{SV}	-	<5 _{SV}	-	-	<5	ug/kg	TM31/PM12
m/p-Xylene #	-	-	<5 _{SV}	-	<5 _{SV}	<5 _{SV}	-	<5 _{SV}	-	-	<5	ug/kg	TM31/PM12
o-Xylene #	-	-	<5 _{SV}	-	<5 _{SV}	<5 _{SV}	-	<5 _{SV}	-	-	<5	ug/kg	TM31/PM12
Total Phenols HPLC	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	0.44	-	<0.15	<0.15	mg/kg	TM26/PM21
Natural Moisture Content	17.0	14.3	22.0	19.4	17.0	14.7	14.1	8.2	9.5	17.0	<0.1	%	PM4/PM0
Hexavalent Chromium #	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	-	<0.3	<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	0.0640	0.0366	-	-	-	-	0.0274	-	-	-	<0.0015	g/l	TM38/PM20

Please include all sections of this report if it is reproduced

Please see attached notes for all abbreviations and acronyms

Client Name: Brownfield Solutions Limited
Reference: C3593
Location: Halsnead Park, Whiston
Contact: Lucy Crawford
JE Job No.: 17/9143

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	203-205	209-211											
Sample ID	TP28	TP29											
Depth	0.20	0.50											
COC No / misc													
Containers	V J T	V J T											
Sample Date	26/05/2017	26/05/2017											
Sample Type	Soil	Soil											
Batch Number	2	2											
Date of Receipt	31/05/2017	31/05/2017											
Please see attached notes for all abbreviations and acronyms											LOD/LOR	Units	Method No.
Pesticides													
Organochlorine Pesticides													
Aldrin	<100 ^{AA}	-									<10	ug/kg	TM42/PM8
Alpha-HCH (BHC)	<100 ^{AA}	-									<10	ug/kg	TM42/PM8
Beta-HCH (BHC)	<100 ^{AA}	-									<10	ug/kg	TM42/PM8
Delta-HCH (BHC)	<100 ^{AA}	-									<10	ug/kg	TM42/PM8
Dieldrin	<100 ^{AA}	-									<10	ug/kg	TM42/PM8
Endosulphan I	<100 ^{AA}	-									<10	ug/kg	TM42/PM8
Endosulphan II	<100 ^{AA}	-									<10	ug/kg	TM42/PM8
Endosulphan sulphate	<100 ^{AA}	-									<10	ug/kg	TM42/PM8
Endrin	<100 ^{AA}	-									<10	ug/kg	TM42/PM8
Gamma-HCH (BHC)	<100 ^{AA}	-									<10	ug/kg	TM42/PM8
Heptachlor	<100 ^{AA}	-									<10	ug/kg	TM42/PM8
Heptachlor Epoxide	<100 ^{AA}	-									<10	ug/kg	TM42/PM8
p,p'-DDE	<100 ^{AA}	-									<10	ug/kg	TM42/PM8
p,p'-DDT	<100 ^{AA}	-									<10	ug/kg	TM42/PM8
p,p'-TDE	<100 ^{AA}	-									<10	ug/kg	TM42/PM8
Total Methoxychlor	<100 ^{AA}	-									<10	ug/kg	TM42/PM8
Organophosphorus Pesticides													
Azinphos methyl	<100 ^{AA}	-									<10	ug/kg	TM42/PM8
Diazinon	<100 ^{AA}	-									<10	ug/kg	TM42/PM8
Dichlorvos	<100 ^{AA}	-									<10	ug/kg	TM42/PM8
Disulfoton	<100 ^{AA}	-									<10	ug/kg	TM42/PM8
Ethion	<100 ^{AA}	-									<10	ug/kg	TM42/PM8
Ethyl Parathion (Parathion)	<100 ^{AA}	-									<10	ug/kg	TM42/PM8
Fenitrothion	<100 ^{AA}	-									<10	ug/kg	TM42/PM8
Malathion	<100 ^{AA}	-									<10	ug/kg	TM42/PM8
Methyl Parathion	<100 ^{AA}	-									<10	ug/kg	TM42/PM8
Mevinphos	<100 ^{AA}	-									<10	ug/kg	TM42/PM8
2,3,6 - TBA	<1.0 ^{AA}	-									<0.1	mg/kg	TM42/PM8
2,4 - D	<1.0 ^{AA}	-									<0.1	mg/kg	TM42/PM8
2,4 - DB	<1.0 ^{AA}	-									<0.1	mg/kg	TM42/PM8
2,4,5 - T	<1.0 ^{AA}	-									<0.1	mg/kg	TM42/PM8
4 - CPA	<1.0 ^{AA}	-									<0.1	mg/kg	TM42/PM8
Benazolin	<1.0 ^{AA}	-									<0.1	mg/kg	TM42/PM8
Bentazone	<1.0 ^{AA}	-									<0.1	mg/kg	TM42/PM8
Bromoxynil	<1.0 ^{AA}	-									<0.1	mg/kg	TM42/PM8
Clopyralid	<1.0 ^{AA}	-									<0.1	mg/kg	TM42/PM8
Dicamba	<1.0 ^{AA}	-									<0.1	mg/kg	TM42/PM8
Dichloroprop	<1.0 ^{AA}	-									<0.1	mg/kg	TM42/PM8
Diclofop	<1.0 ^{AA}	-									<0.1	mg/kg	TM42/PM8
Fenoprop	<1.0 ^{AA}	-									<0.1	mg/kg	TM42/PM8
Flamprop	<1.0 ^{AA}	-									<0.1	mg/kg	TM42/PM8

Client Name: Brownfield Solutions Limited
Reference: C3593
Location: Halsnead Park, Whiston
Contact: Lucy Crawford
JE Job No.: 17/9143

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	203-205	209-211											
Sample ID	TP28	TP29											
Depth	0.20	0.50											
COC No / misc													
Containers	V J T	V J T											
Sample Date	26/05/2017	26/05/2017											
Sample Type	Soil	Soil											
Batch Number	2	2											
Date of Receipt	31/05/2017	31/05/2017											
Please see attached notes for all abbreviations and acronyms											LOD/LOR	Units	Method No.
Flamprop – isopropyl	<1.0 ^{AA}	-									<0.1	mg/kg	TM42/PM8
Ioxynil	<1.0 ^{AA}	-									<0.1	mg/kg	TM42/PM8
MCPA	<1.0 ^{AA}	-									<0.1	mg/kg	TM42/PM8
MCPB	<1.0 ^{AA}	-									<0.1	mg/kg	TM42/PM8
Mecoprop	<1.0 ^{AA}	-									<0.1	mg/kg	TM42/PM8
Pentachlorophenol	<1.0 ^{AA}	-									<0.1	mg/kg	TM42/PM8
Picloram	<1.0 ^{AA}	-									<0.1	mg/kg	TM42/PM8
Triclopyr	<1.0 ^{AA}	-									<0.1	mg/kg	TM42/PM8
TPH CWG													
Aliphatics													
>C5-C6 [#]	-	<0.1									<0.1	mg/kg	TM36/PM12
>C6-C8 [#]	-	<0.1									<0.1	mg/kg	TM36/PM12
>C8-C10	-	<0.1									<0.1	mg/kg	TM36/PM12
>C10-C12 [#]	-	<0.2									<0.2	mg/kg	TM5/PM16
>C12-C16 [#]	-	<4									<4	mg/kg	TM5/PM16
>C16-C21 [#]	-	<7									<7	mg/kg	TM5/PM16
>C21-C35 [#]	-	<7									<7	mg/kg	TM5/PM16
Total aliphatics C5-35	-	<19									<19	mg/kg	TM5/PM16/PM12/PM16
Aromatics													
>C5-EC7 [#]	-	<0.1									<0.1	mg/kg	TM36/PM12
>EC7-EC8 [#]	-	<0.1									<0.1	mg/kg	TM36/PM12
>EC8-EC10 [#]	-	<0.1									<0.1	mg/kg	TM36/PM12
>EC10-EC12 [#]	-	<0.2									<0.2	mg/kg	TM5/PM16
>EC12-EC16 [#]	-	<4									<4	mg/kg	TM5/PM16
>EC16-EC21 [#]	-	<7									<7	mg/kg	TM5/PM16
>EC21-EC35 [#]	-	109									<7	mg/kg	TM5/PM16
Total aromatics C5-35 [#]	-	109									<19	mg/kg	TM5/PM16/PM12/PM16
Total aliphatics and aromatics(C5-35)	-	109									<38	mg/kg	TM5/PM16/PM12/PM16
MTBE [#]	-	<5									<5	ug/kg	TM31/PM12
Benzene [#]	-	<5									<5	ug/kg	TM31/PM12
Toluene [#]	-	<5									<5	ug/kg	TM31/PM12
Ethylbenzene [#]	-	<5									<5	ug/kg	TM31/PM12
m/p-Xylene [#]	-	<5									<5	ug/kg	TM31/PM12
o-Xylene [#]	-	<5									<5	ug/kg	TM31/PM12
Total Phenols HPLC	-	<0.15									<0.15	mg/kg	TM26/PM21
Natural Moisture Content	13.7	13.7									<0.1	%	PM4/PM0
Hexavalent Chromium [#]	-	<0.3									<0.3	mg/kg	TM38/PM20
Sulphate as SO ₄ (2:1 Ext) [#]	-	-									<0.0015	g/l	TM38/PM20

Please see attached notes for all abbreviations and acronyms

Matrix : Solid

10 of 17

Client Name: Brownfield Solutions Limited
Reference: C3593
Location: Halsnead Park, Whiston
Contact: Lucy Crawford

Note:

Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Samples are retained for not less than 6 months from the date of analysis unless specifically requested.

Opinions, including ACM type and Asbestos level, lie outside the scope of our UKAS accreditation.

Where the sample is not taken by a Jones Environmental Laboratory consultant, Jones Environmental Laboratory cannot be responsible for inaccurate or unrepresentative sampling.

Signed on behalf of Jones Environmental Laboratory:



Ryan Butterworth
Asbestos Team Leader

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Date Of Analysis	Analysis	Result
17/9143	2	TP14	0.50	132	02/06/2017	General Description (Bulk Analysis)	soil-stones
					02/06/2017	Asbestos Fibres	NAD
					02/06/2017	Asbestos Fibres (2)	NAD
					02/06/2017	Asbestos ACM	NAD
					02/06/2017	Asbestos ACM (2)	NAD
					02/06/2017	Asbestos Type	NAD
					02/06/2017	Asbestos Type (2)	NAD
					02/06/2017	Asbestos Level Screen	NAD
17/9143	2	TP18	0.60	156	02/06/2017	General Description (Bulk Analysis)	soil-stones
					02/06/2017	Asbestos Fibres	NAD
					02/06/2017	Asbestos Fibres (2)	NAD
					02/06/2017	Asbestos ACM	NAD
					02/06/2017	Asbestos ACM (2)	NAD
					02/06/2017	Asbestos Type	NAD
					02/06/2017	Asbestos Type (2)	NAD
					02/06/2017	Asbestos Level Screen	NAD
17/9143	2	TP22	0.25	174	02/06/2017	General Description (Bulk Analysis)	soil-stones
					02/06/2017	Asbestos Fibres	NAD
					02/06/2017	Asbestos Fibres (2)	NAD
					02/06/2017	Asbestos ACM	NAD
					02/06/2017	Asbestos ACM (2)	NAD
					02/06/2017	Asbestos Type	NAD
					02/06/2017	Asbestos Type (2)	NAD
					02/06/2017	Asbestos Level Screen	NAD
17/9143	2	TP29	0.50	210	02/06/2017	General Description (Bulk Analysis)	soil-stones
					02/06/2017	Asbestos Fibres	NAD
					02/06/2017	Asbestos Fibres (2)	NAD
					02/06/2017	Asbestos ACM	NAD
					02/06/2017	Asbestos ACM (2)	NAD
					02/06/2017	Asbestos Type	NAD
					02/06/2017	Asbestos Type (2)	NAD
					02/06/2017	Asbestos Level Screen	NAD

Matrix : Solid

Location: Halsnead Park, Whiston

Contact: Lucy Crawford

[illegible]

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 17/9143

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS) accredited - UK.
SA	ISO17025 (SANAS) accredited - South Africa.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x10 Dilution

JE Job No: 17/9143

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.				
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	
TM5/TM36	TM005: Modified USEPA 8015B. Determination of solvent Extractable Petroleum Hydrocarbons (EPH) including column fractionation in the carbon range of C10-35 into aliphatic and aromatic fractions by GC-FID. TM036: Modified USEPA 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C5-10 by headspace GC-FID. Including determination of PTEX.	PM12/PM16	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis./Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM5/TM36	TM005: Modified USEPA 8015B. Determination of solvent Extractable Petroleum Hydrocarbons (EPH) including column fractionation in the carbon range of C10-35 into aliphatic and aromatic fractions by GC-FID. TM036: Modified USEPA 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C5-10 by headspace GC-FID. Including determination of PTEX and calculation of Aliphatic fractions.	PM12/PM16	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis./Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM21	Modified USEPA 415.1. Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.			AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21	As received solid or water samples are extracted in Methanol: Sodium Hydroxide (0.1M NaOH) (60:40) by orbital shaker.			AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes

JE Job No: 17/9143

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM42	Modified US EPA method 8270. Pesticides and herbicides by GC-MS	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	Dried and ground solid sample is boiled with dilute hydrochloric acid, the resulting liquor is then analysed.	Yes		AD	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.			AR	
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	

JE Job No: 17/9143

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM74	Analysis of water soluble boron (20:1 extract) by ICP-OES.	PM32	Hot water soluble boron is extracted from dried and ground samples using a 20:1 ratio.	Yes		AD	Yes
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide and Thiocyanate analysis.			AR	Yes
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide and Thiocyanate analysis.	Yes		AR	Yes
TM106	Determination of Sulphide by Skalar Continuous Flow Analyser	PM119	As received solid samples are extracted with 1M NaOH by orbital shaker for Sulphide and Thiocyanate analysis.			AR	Yes
TM107	Determination of Thiocyanate by Skalar Continuous Flow Analyser	PM119	As received solid samples are extracted with 1M NaOH by orbital shaker for Sulphide and Thiocyanate analysis.			AR	Yes

APPENDIX C

Geotechnical Testing Results



LABORATORY REPORT REPORT



4043

Contract Number: PSL17/2652

Report Date: 14 June 2017

Client's Reference: C3593

Client Name: Brownfield Solutions
William Smith House
173-183 Willton Street
Northwich
Cheshire
CW9 5LP

For the attention of: Lucy Crawford

Contract Title: Whiston

Date Received: 5/6/2017

Date Commenced: 5/6/2017

Date Completed: 14/6/2017

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. 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. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

R Gunson
(Director)

A Watkins
(Director)

R Berriman
(Quality Manager)

L Knight
(Senior Technician)

C Marshall
(Laboratory Manager)

A Fry
(Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
WS01		D	1.50		Brown slightly gravelly sandy CLAY.
WS02		D	1.15		Brown slightly gravelly sandy CLAY.
WS02		D	2.00		Brown slightly gravelly very sandy CLAY.
WS03		D	1.00		Brown slightly gravelly slightly sandy CLAY.
WS03		D	2.20		Brown gravelly slightly sandy CLAY.
WS04		D	1.00		Brown slightly gravelly sandy CLAY.
WS07		D	1.20		Brown mottled grey slightly gravelly slightly sandy CLAY.
WS09		D	1.60		Brown slightly gravelly sandy CLAY.
WS10		D	1.30		Grey slightly gravelly slightly sandy CLAY.
TP01		D	1.00		Brown slightly gravelly very sandy CLAY.
TP03		D	0.80		Brown slightly gravelly slightly sandy CLAY.
TP06		D	0.60		Brown slightly gravelly sandy CLAY.
TP10		D	1.70		Brown slightly gravelly slightly sandy CLAY.
TP11		D	0.70		Brown slightly gravelly very sandy CLAY.
TP12		D	1.00		Brown slightly gravelly sandy CLAY.
TP13		D	2.15		Brown slightly gravelly very sandy CLAY.
TP14		D	2.35		Brown slightly gravelly very sandy CLAY.
TP15		D	1.25		Brown slightly gravelly slightly sandy CLAY.
TP16		D	1.90		Brown slightly gravelly very sandy CLAY.



WHISTON

Contract No:

PSL17/2652

Client Ref:

C3593

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

[illegible]

PSL
Professional Soils Laboratory

WHISTON**Contract No:**

PSL17/2652

Client Ref:

C3593

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m ³ Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
WS01		D	1.50		18			35	20	15	94	Low plasticity CL.
WS02		D	1.15		23			38	21	17	94	Intermediate plasticity CL.
WS02		D	2.00		17			26	16	10	92	Low plasticity CL.
WS03		D	1.00		24			60	27	33	96	High plasticity CH.
WS03		D	2.20		34			56	27	29	84	High plasticity CH.
WS04		D	1.00		16			38	23	15	90	Intermediate plasticity CL.
WS07		D	1.20		30			61	27	34	92	High plasticity CH.
WS09		D	1.60		17			32	16	16	96	Low plasticity CL.
WS10		D	1.30		39			51	28	23	90	High plasticity CH.
TP01		D	1.00		17			27	17	10	96	Low plasticity CL.
TP03		D	0.80		28			55	28	27	97	High plasticity CH.
TP06		D	0.60		16			33	17	16	96	Low plasticity CL.
TP10		D	1.70		24			51	26	25	98	High plasticity CH.
TP11		D	0.70		19			31	16	15	92	Low plasticity CL.
TP12		D	1.00		15			32	18	14	96	Low plasticity CL.
TP13		D	2.15		15			28	14	14	92	Low plasticity CL.
TP14		D	2.35		18			29	15	14	94	Low plasticity CL.
TP15		D	1.25		24			51	23	28	97	High plasticity CH.
TP16		D	1.90		17			29	16	13	96	Low plasticity CL.

SYMBOLS : NP : Non Plastic

* : Liquid Limit and Plastic Limit Wet Sieved.



PSL
Professional Soils Laboratory

WHISTON

Contract No:

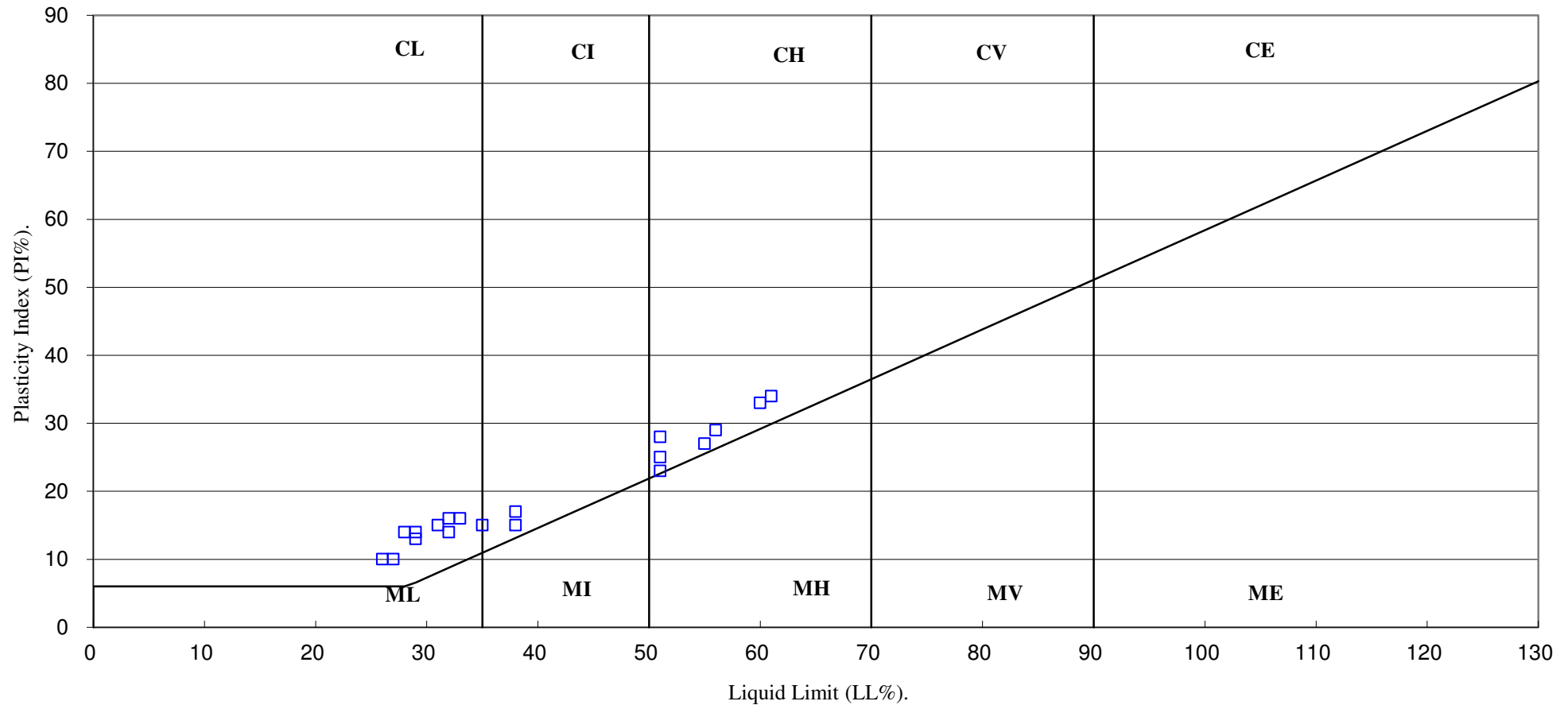
PSL17/2652

Client Ref:

C3593

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

(BS5930 :2015)



PSL
Professional Soils Laboratory

WHISTON

Contract No:

PSL17/2652

Client Ref:

C3593

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

[illegible]

SYMBOLS : NP : Non Plastic

* : Liquid Limit and Plastic Limit Wet Sieved.



PSL
Professional Soils Laboratory

WHISTON

Contract No:

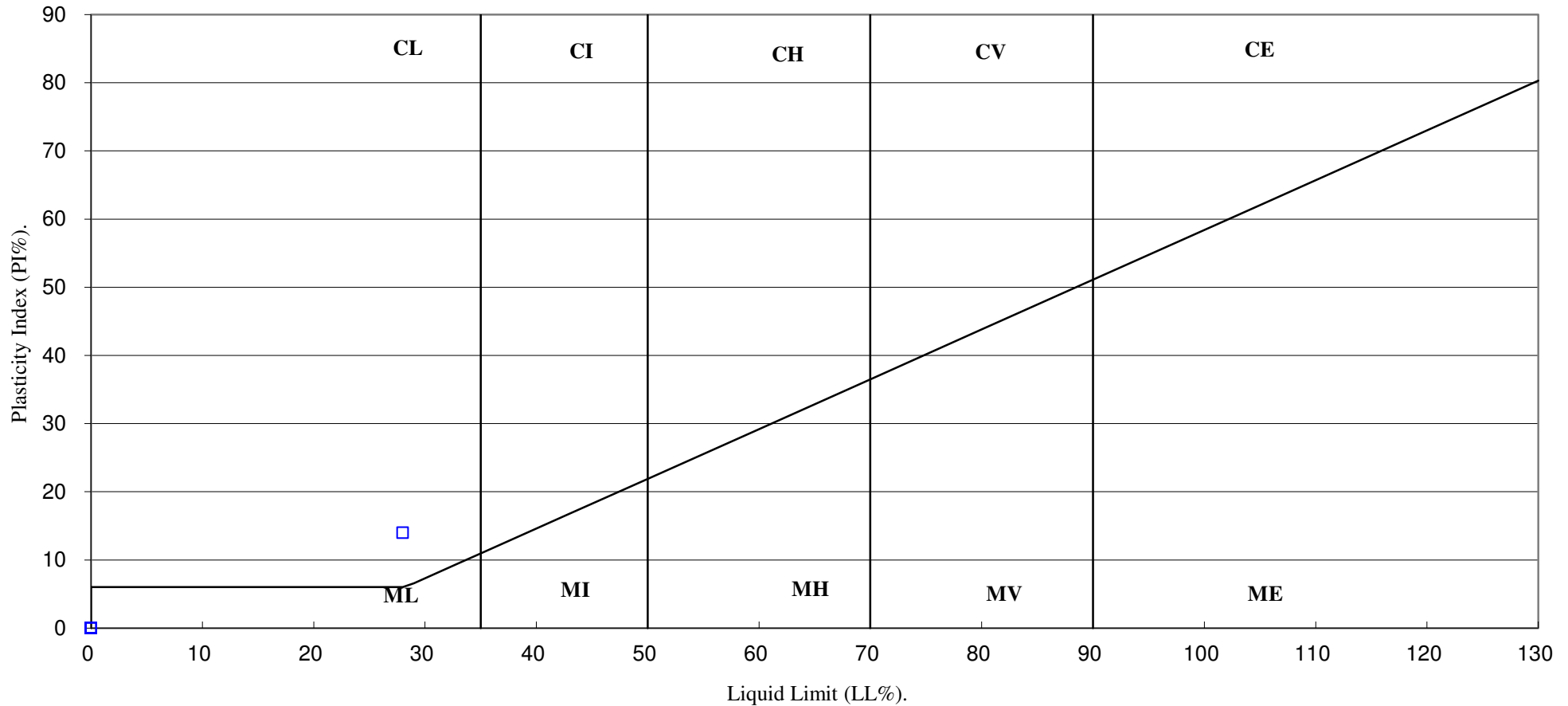
PSL17/2652

Client Ref:

C3593

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

(BS5930 :2015)



PSL
Professional Soils Laboratory

WHISTON

Contract No:

PSL17/2652

Client Ref:

C3593



Exova Jones Environmental

Registered Address : Exova (UK) Ltd, Lochend Industrial Estate, Newbridge, Midlothian, EH28 8PL

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

Brownfield Solutions Limited
173-183 Witton Street
Northwich
Cheshire
CW9 5LP

Tel: +44 (0) 1244 833780

Fax: +44 (0) 1244 833781



Attention :	Lucy Crawford
Date :	16th June, 2017
Your reference :	C3593
Our reference :	Test Report 17/9774 Batch 1
Location :	Whiston
Date samples received :	3rd June, 2017
Status :	Final report
Issue :	1

Twenty samples were received for analysis on 3rd June, 2017 of which twenty were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Bruce Leslie
Project Co-ordinator

Client Name: Brownfield Solutions Limited

Reference: C3593

Location: Whiston

Contact: Lucy Crawford

[illegible]

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 17/9774

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

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Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

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The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

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Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

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DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

JE Job No: 17/9774

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	Dried and ground solid sample is boiled with dilute hydrochloric acid, the resulting liquor is then analysed.			AD	Yes
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No



APPENDIX D
Interim Gas Monitoring Results

23/06/2017

**BROWNFIELD
SOLUTIONS LTD**
GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

Key	
ND	Not Detected
NA	Not Available
NGW	No Groundwater

	Percentage Concentrations				Parts per Million		mb				
Ambient	Oxygen (O ₂)	Carbon Dioxide (CO ₂)	Methane (CH ₄)	LEL	Hydrogen Sulphide (H ₂ S)	Carbon Monoxide (CO)	Atm Pressure	Monitored by	Equipment	Weather	Pressure Trend
Start	21.4	0.0	0.0	0.0	0.0	NA	1008	JB	GA5000	Overcast	Steady
Finish	21.3	0.1	0.0	0.0	0.0	NA	1008				

		Percentage Concentrations				Parts Per Million		m bgl	litres/hour	mb		litres/hour	litres/hour	
Location	State (Peak/Steady)	Oxygen (O ₂)	Carbon Dioxide (CO ₂)	Methane (CH ₄)	LEL	Hydrogen Sulphide (H ₂ S)	Carbon Monoxide (CO)	Water Level	Flow	Relative Pressure	Sheen (Y/N)	Q _{hg} CO ₂	Q _{hg} CH ₄	Notes
WS01	Peak	0.8	18.5	0.1	0.5	0.0	NA	NGW	0.2	-0.1	No	0.04	0.00	
	Steady	0.8	17.7	0.1	0.5	1.0	NA							
WS03	Peak	NA	NA	NA	NA	NA	NA	NA	NA	NA	No	NA	NA	couldn't Locate
	Steady	NA	NA	NA	NA	NA	NA							
WS04	Peak	12.4	9.3	0.0	0.0	0.0	NA	2.49	0.1	0.0	No	0.01	0.00	
	Steady	12.3	9.0	0.0	0.0	0.0	NA							
WS07	Peak	16.4	4.2	0.0	0.0	0.0	NA	1.91	0.1	0.0	No	0.00	0.00	
	Steady	16.4	4.2	0.0	0.0	0.0	NA							
WS08	Peak	18.7	2.4	0.0	0.0	0.0	NA	1.82	0.0	-1.6	No	0.00	0.00	
	Steady	18.5	2.4	0.0	0.0	0.0	NA							
WS10	Peak	21.2	0.2	0.0	0.0	0.0	NA	0.84	0.1	0.0	No	0.00	0.00	
	Steady	21.4	0.0	0.0	0.0	0.0	NA							
WS11	Peak	18.6	3.8	0.0	0.0	0.0	NA	NGW	0.1	-0.1	No	0.00	0.00	
	Steady	18.6	3.4	0.0	0.0	1.0	NA							
WS12	Peak	21.3	0.2	0.0	0.0	0.0	NA	NGW	0.1	0.0	No	0.00	0.00	
	Steady	21.3	0.2	0.0	0.0	0.0	NA							

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Key	
ND	Not Detected
NA	Not Available
NGW	No Groundwater

	Percentage Concentrations				Parts per Million		mb				
Ambient	Oxygen (O ₂)	Carbon Dioxide (CO ₂)	Methane (CH ₄)	LEL	Hydrogen Sulphide (H ₂ S)	Carbon Monoxide (CO)	Atm Pressure	Monitored by	Equipment	Weather	Pressure Trend
Start	21.1	0.1	0.0	0.0	0.0	NA	1015	JB	GA5000	Clear	Steady
Finish	20.8	0.0	0.0	0.0	0.0	NA	1015				

		Percentage Concentrations				Parts Per Million		m bgl	litres/hour	mb		litres/hour	litres/hour	
Location	State (Peak/Steady)	Oxygen (O ₂)	Carbon Dioxide (CO ₂)	Methane (CH ₄)	LEL	Hydrogen Sulphide (H ₂ S)	Carbon Monoxide (CO)	Water Level	Flow	Relative Pressure	Sheen (Y/N)	Q _{hg} CO ₂	Q _{hg} CH ₄	Notes
WS01	Peak	2.1	16.7	0.0	0.0	0.0	NA	NGW	0.1	0.1	No	0.02	0.00	
	Steady	2.0	15.9	0.0	0.0	0.0	NA							
WS03	Peak	17.1	6.5	0.0	0.0	0.0	NA	NGW	0.1	0.1	No	0.01	0.00	
	Steady	17.2	6.0	0.0	0.0	0.0	NA							
WS04	Peak	14.9	7.5	0.0	0.0	0.0	NA	2.66	0.1	-0.1	No	0.01	0.00	
	Steady	14.9	7.0	0.0	0.0	0.0	NA							
WS07	Peak	16.2	2.6	0.0	0.0	0.0	NA	NGW	0.1	0.1	No	0.00	0.00	
	Steady	16.2	2.4	0.0	0.0	0.0	NA							
WS08	Peak	15.8	3.9	0.0	0.0	0.0	NA	1.98	0.1	0.0	No	0.00	0.00	
	Steady	15.8	3.9	0.0	0.0	0.0	NA							
WS10	Peak	20.6	0.1	0.0	0.0	0.0	NA	0.89	0.1	0.0	No	0.00	0.00	
	Steady	20.7	0.0	0.0	0.0	0.0	NA							
WS11	Peak	18.7	2.4	0.0	0.0	0.0	NA	NGW	0.1	-0.1	No	0.00	0.00	
	Steady	18.7	2.3	0.0	0.0	0.0	NA							
WS12	Peak	20.0	0.9	0.0	0.0	0.0	NA	NGW	0.0	0.0	No	0.00	0.00	
	Steady	20.0	0.9	0.0	0.0	0.0	NA							

APPENDIX E

Contaminated Land Screening Values

Contaminated Land Screening Values

In assessing the potential for contamination Brownfield Solutions Limited (BSL) follows UK guidance and current best practice.

General

The current recommended method for assessing contamination is on the basis of:

Source-Pathway-Receptor

Where any one of these “pollution linkages” is absent there is deemed to be no risk.

Fundamentally receptors can be considered as humans and controlled waters (surface and ground waters).

The purpose of using Tier 1 screening levels is to have a simple means of assessing the potential contamination of a site and to inform decisions on whether further investigation is warranted or whether an option to undertake clean up based on the data to hand is cost effective.

Human Health

Current UK guidance is provided by DEFRA and the Environment Agency (EA). Publications forming part of the guidance include; CLEA Model, toxicological reports and soil guideline values (SGV), collectively referred to as the CLEA Guidance. The CLEA Guidance has included a number of publications which have provided initial screening values for soil contamination based on standard land uses and soil assumptions.

CLEA guidance has gone through a number of revisions, all of the original SGV's that were published have been withdrawn and publication of new SGV's commenced in 2009.

For determinands where no SGVs are available, S4UL values have been published using the CLEA 1.06 Model. These are the third set of generic assessment criteria generated by CIEH, and replace the previous two sets of GACs. The revised S4UL values are based on greater knowledge of relevant toxicology and further consideration of exposure frequencies.

No SGV or S4UL is available for lead as this is derived based on blood lead levels. C4SL values for six determinands including lead was published by DEFRA/CL:AIRE in December 2014 and they represent a low risk as opposed to minimal risk. The C4SL values are based on a sandy loam with 6% Soil Organic Matter. These screening values were published by DEFRA for Part 2A use, although with the dual purpose for use under planning. However these have not been officially accepted by Local Government for use under planning. S4ULs remain the first reference due to the broader range of end uses and soil organic content.

The preference from the EA is that site specific screening levels are used wherever possible. Due to numerous factors it is not always possible to utilise site specific values. In these instances the following data sources are used in the order of preference given below:

- Current UK SGV's
- CIEH S4UL values (derived by CIEH/LQM)
- DEFRA/CL:AIRE C4SL's
- CL:AIRE GAC values
- Guidance from other European countries
- Guidance from the outside Europe.

Controlled Waters

The European Water Framework Directive (WFD) became UK law in December 2003. It was created to ensure that European countries manage their rivers, groundwater and lakes so that they stay healthy for people and for wildlife.

This is achieved by the use of chemical standards for surface waters and groundwater. These values describe concentrations of chemicals that are not expected to cause harm to environmental organisms or human health, provided they are not exceeded. The same chemical may have several standards for different environmental regimes, and for different protection objectives.

Statutory Standards are set in legislation and if exceeded, this constitutes non-compliance with statutory obligations. European Directives are implemented in England and Wales by corresponding statutory instruments (i.e. regulations). The statutory instruments can be the exact same standards as they appear in the Directive or be more stringent.

A number of non-statutory standards also exist, these are set by various organisations (including the EA) for chemicals that are considered to be of concern, but are not covered by any specific legislation.

The chemical standards used in the UK to control impact of contamination on controlled waters are Environmental Quality Standards (EQS). The EQS's cover a large number of compounds.

Where certain compounds are not covered by the EQS these are commonly compared to the UK Drinking Water Standards (DWS).

Further Assessment

When screening values are exceeded then further consideration is required. This could include the use of simple measures to break the pollution pathway and mitigate the risk, further more detailed investigation, including the deriving of site specific values to better define the risk and to design appropriate remedial measures.

APPENDIX F
Waste Disposal Guidance Note

WASTE CLASSIFICATION FOR SOILS

Introduction

Waste producers have a duty of care classify the waste they are producing:

- before it is collected, disposed of or recovered.
- to identify the controls that apply to the movement of the waste.
- to complete waste documents and records.
- to identify suitably authorised waste management options.
- to prevent harm to people and the environment.

The most sustainable and economic method of dealing with waste soil is usually the retention and re-use on site.

Where this is not possible there are three main options for the disposal of soils:

1. Disposal to a permitted waste recycling facility.
2. Re-use on another site (subject to the suitability).
3. Disposal to a landfill site.

The disposal to a permitted facility will be subject to the **specific conditions of the permits for each of individual facility** and will vary dependent on location and environmental sensitivity of the receiving site. Re-use on another site will also be subject to the acceptability criteria of that site.

The guidance below relates to disposal to **landfill sites only**.

Background for Landfill Disposal

In July 2005 the United Kingdom implemented the European Directive 1999/31/EC (The Landfill Directive), this introduced the current regime for waste and waste disposal to landfill. The Landfill Directive places controls on waste disposal. These controls include requirements to follow the waste acceptance procedures and criteria that have been agreed by the Council of the European Union and are laid out in Council Decision 2003/33/EC.

Before a waste can be accepted at a landfill site, the landfill **operator** must be satisfied that the waste meets his permit conditions, the waste acceptance procedures (WAP) and waste acceptance criteria (WAC).

If disposal to landfill is the best management option for the waste soils, these procedures **must** be followed or the operator may refuse to accept the waste.

Key Points

- Not all waste can be landfilled
- Landfills are classified according to whether they can accept **hazardous, non-hazardous** or **inert** wastes.
- Wastes can only be accepted at a landfill if they meet the waste acceptance criteria (WAC) for that class of landfill.
- Most wastes must be treated before you can send them to landfill.
- There are formal processes for identifying and checking wastes that must be followed before wastes can be accepted at a landfill site.

Classification

Wastes are listed in the European Waste Catalogue (EWC 2002) and grouped according to generic industry, process or waste types. Wastes within the EWC are either hazardous or non-hazardous. Some of these wastes are hazardous without further assessment (absolute entries) or are 'mirror' entries that require further assessment of their hazardous properties in order to determine whether they are hazardous waste.

Waste soil has mirror entries on the EWC and as such the first phase of the waste classification process is that of determining if the waste is hazardous or not ie the hazard assessment. The most common EWC waste codes related to soil are:

17 05	soil (including excavated soil from contaminated sites), stones and dredging spoil
17 05 03*	soil and stones containing dangerous substances
17 05 04	soil and stones other than those mentioned in 17 05 03

Soils may contain certain contaminants (eg asbestos, diesel) which have prescribed concentration thresholds, that if breached will render the material hazardous waste. These are based on “risk phrases” which can include risks such as carcinogenicity, flammability or toxicity.

In the first instance the concentrations of plausible contaminants within the soil should be identified and wastes should be **classified based on their total concentrations**.

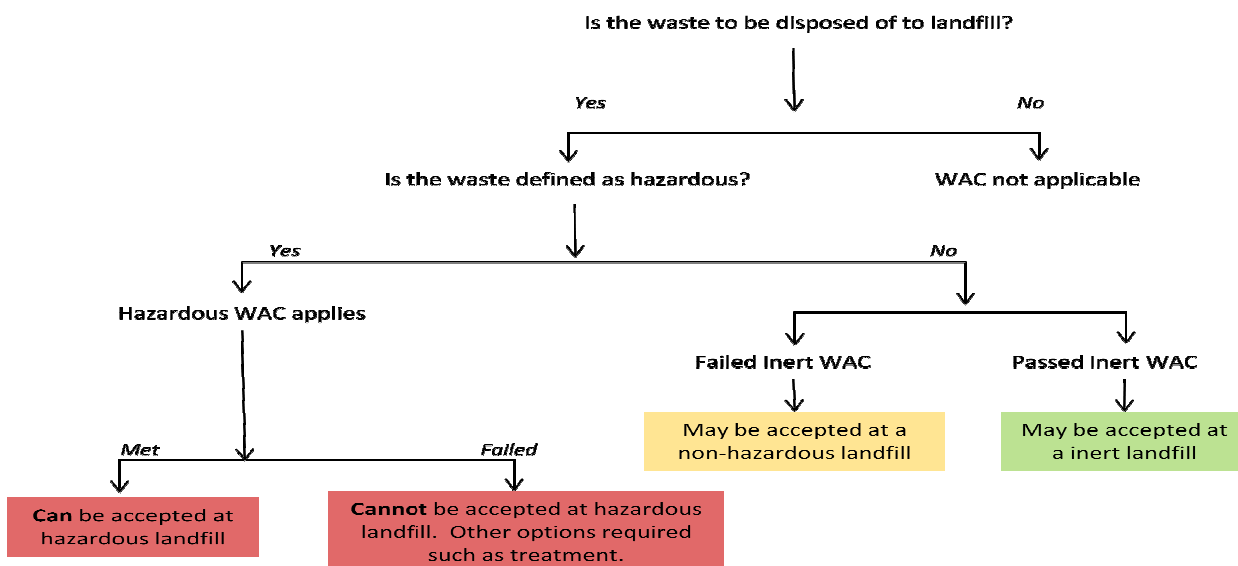
Waste Definitions

Inert	- Will not undergo any significant physical, chemical or biological transformations. - Will not dissolve. - Will not burn. - Will not physically or chemically react. - Will not biodegrade. - Will not adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or harm to human health. - Has insignificant total leachability and pollutant content. - Produces a leachate with an ecotoxicity that is insignificant (if it produces leachate).
Non-Hazardous	Is not inert (see above) Is not hazardous (see below)
Hazardous	Soil has hazardous properties as defined in WM3 (.Guidance on the classification and assessment of waste (1st edition 2015)- Technical Guidance)
Stable Non-reactive hazardous waste [#]	Hazardous waste, the leaching behaviour of which will not change adversely in the long-term, under landfill design conditions or foreseeable accidents: in the waste alone (for example, by biodegradation); under the impact of long-term ambient conditions (for example, water, air, temperature or mechanical constraints); by the impact of other wastes (including waste products such as leachate and gas).

This option allows hazardous waste that has been stabilised and thus has a low leaching potential to be deposited in cells with a standard of containment consistent with non-hazardous wastes.

WAC Testing

The purpose of WAC analysis is to confirm that the waste complies with the relevant WAC for the receiving landfill. The WAC limits **cannot be used to make an assessment of whether a waste is hazardous**. WAC testing does however define if a non-hazardous waste is suitable for an inert landfill.



Hydrocarbons in Soils

WM3 uses the term Oil or Waste Oil to cover hydrocarbons products such as fuel oil, petrol or diesel. These are defined by WM3 as hazardous under an absolute entry in the List of Wastes. However hydrocarbons in soils are a mixture rather than a pure product and absolute entries are not relevant.

Known Oils

The simplest scenario is where the identity of the contaminating oil is known, or can be identified. If the oil is known the manufacturer's or supplier's REACH compliant safety data sheet for the specific oil can be obtained and the hazard statement codes on that Safety Data Sheet can be used for the hazardous waste assessment.

Where the identity of the oil can only be identified down to a petroleum group level (i.e. the contaminating oil is known to be diesel, but the specific type/brand is unknown), then the classification of that petroleum group should be used in the assessment. The marker compounds associated with that petroleum group may be used to confirm carcinogenicity.

Oils may contain a range of hydrocarbons, so the presence of for instance Diesel Range Organics (DRO) does not enable the assessor to conclude that diesel is present. These hydrocarbons may have arisen from other oils, the laboratory needs to provide an interpretation that the chromatograph is consistent with diesel or weathered diesel as a whole.

The concentration of known oils should be determined using a method that as a minimum spans the range in which the carbon numbers for that known oil fall.

Unknown Oils

Where hydrocarbons are contaminating soils it is likely that the oil will be unknown or cannot be determined.

WM3 states that:

For contaminated land specific consideration must be given to the following before proceeding;

- The presence of other organic contaminants, for example solvents or coal tar that could be detected as hydrocarbons. Coal Tar is not an oil and is considered separately in example 2. Where the site history or investigation indicates the presence of hydrocarbons from oil and other sources (e.g. coal tar), and the origin of the hydrocarbons cannot reliably be assigned to either, then a worst case approach of considering the hydrocarbons both as, waste oil (in accordance with this example) and from other sources, for example coal tar should be taken.
- The presence of diesel, or weathered diesel, should be specifically considered by the laboratory and where this is confirmed by the hydrocarbon profile the oil should be assessed as a known or identified oil (diesel).

The use of **marker compounds** is optional; however it is recommended that where possible the marker compounds should be used.

WM3 states:

If the identity of the oil is unknown, and the petroleum group cannot be established, then the oil contaminating the waste can be classified as non-carcinogenic/mutagenic due to the presence of oil if all three of the following criteria are met:

- The waste contains benzo[a]pyrene (BaP) at a concentration of less than 0.01% (1/10,000th) of the TPH concentration (This is the carcinogenic limit specified in table 3.1 of the CLP for BaP)
- This has been determined by an appropriate and representative sampling approach in accordance with the principles set out in Appendix D, and
- The analysis clearly demonstrates, for example by carbon bands or chromatograph, and the laboratory has reasonably concluded that the hydrocarbons present have not arisen from petrol or diesel.

For example:

TPH Concentration (mg/kg)	Petrol or Diesel	BaP (mg/kg)	Classification
10,000	No	0.9	Non- Hazardous
1,000	No	Not available	Hazardous
1,000	Yes	Not relevant	Hazardous

References

1. Environmental Permitting (England and Wales) Regulations 2010 (as amended) (EP Regulations), the Landfill Directive (1999/31/EC) and the Council Decision (2003/33/EC).
2. Environment Agency Environmental Permitting Regulations: *"Inert Waste Guidance- Standards and Measures for the Deposit of Inert Waste on Land"* 2009.
3. Environment Agency *"Waste acceptance at landfills - Guidance on waste acceptance procedures and criteria"* Nov 2010.
4. Environment Agency *"Guidance on the classification and assessment of waste (Technical Guidance WM3)"* 1st edition May 2015.
5. Classification, Labelling and Packaging of Substances Regulation (EC 1272/2008) (CLP).

APPENDIX G
CL:AIRE CoP Guidance Note

RE-USE OF WASTE - GUIDANCE NOTE

Definition of Waste:

The Environment Agency considers waste to be “...any material that is discarded, or intended to be discarded...” This includes any soil from trenches, footing, site strip etc. It is no longer required in its original location, therefore it is considered to be waste.

Re-use of Waste

Previously large scale earthworks and remedial schemes relied on waste management exemptions to allow the re-use of waste. However in 2010 the Environment Agency in England and Wales removed many of the waste management licence exemptions and severely restricted the quantity of materials available for other exemptions.

For purposes of earthworks and remediation, the previous exemptions available have been replaced by CL:AIRE Code of Practice (CoP), also commonly referred to as a “Materials Management Plan”.

CL:AIRE: Code of Practice

Where materials are excavated for construction purposes, wherever possible these should be retained on site for engineering purposes if they are suitable for use. The developer/contractor is advised to complete all works under the CL:AIRE “Development Industry Code of Practice for the Definition of Waste” (CL:AIRE CoP).

Potential scenarios where soils may be able to be re-used:

- Material capable of being used in another place on the same site without treatment;
- Material capable of being used in another place on the same site following ex-situ treatment on site;
- Material capable of being used in another development site without treatment (Direct Transfer);
- Material capable of being used in another development site following ex-situ treatment on another site eg Hub site;

The Code of Practice requires 4 No. Factors to be addressed:

1. Protection of human health and protection of the environment.
2. Suitability of use, without further treatment.
3. Certainty of use.
4. Quantity of material.

In order to satisfy these requirements the following are required:

- i) Consultation/approval with Local Authority & Environment Agency to confirm they have no objections to the proposed re-use of waste soils, or the risk assessments for the site.
- ii) Risk Assessments to demonstrate that the site does not present an Environmental Hazard.
- iii) Remediation Strategy for contaminated sites (or Design Statement for non-contaminated sites).
- iv) Materials Management Plan (MMP) which details material generated stockpiles and the end use.
- v) Volume calculations.
- vi) Planning permission for the development.
- vii) Contractual details to be clear, regarding who steps in is a contractor goes into administration/liquidation.

The use of the CoP is effectively industry regulated, there is a requirement to appoint an independent Qualified Person (QP) who checks all the requirements have been met and registers the documentation with the Environment Agency. This person must not have had any involvement with the preparing of the risk assessments or remedial strategy on the site.

Soils which require treatment on site (eg bioremediation, stabilisation) will require an Environmental Permit for treatment, together with justification and validation to prove, once treated, this material is suitable for use.

Site management procedures need to be in place to ensure that material is tracked through from excavation stockpiling, treatment and remediation processes. Should the process of material tracking be considered non-robust, or not adhered to, this may fail the test whether excavated materials may be considered non-waste.

APPENDIX H

Contaminated Land Legislative Background

Legislative Background

Environmental liabilities and risks have been evaluated in terms of a source - pathway - target relationship in accordance with the approach set out in:

- The 1995 Environment Act;
- The Contaminated Land (England) Regulations 2000;
- The DETR circular 02/2000 Environmental Protection Act 1990: Part IIA Contaminated Land.

Contaminated land is defined within the legislative framework as land which is in such condition by reason of substances in, on or under the land that:

- 1) Significant harm is being caused or there is a significant possibility of such harm being caused;
- 2) Significant pollution of controlled waters is being or is likely to be caused.

The potential for harm is based on the presence of three factors:

- **Source** - substances that are potential contaminants or pollutants that may cause harm;
- **Pathway** - a potential route by which contaminants can move from the source to the receptor;
- **Receptor** - a receptor that may be harmed, for example the water environment, humans and water.

Where a source, pathway and target are all present a pollutant linkage exists and there is potential for harm to be caused. The presence of a source does not automatically imply that a contamination problem exists, since contamination must be defined in terms of pollutant linkages and unacceptable risk of harm. The nature and importance of both pathways and receptors are site specific and will vary according to the intended end use of the site, its characteristics and its surroundings.

The key principle which supports the SPR approach is 'suitable for use' criteria. This requires remedial action only where contamination is considered to pose unacceptable actual or potential risks to health or the environment and, taking into account the proposed use of the site.

Relevant Guidance Documents

This report has been prepared in accordance with the list of guidance below however the list is not exhaustive:

- CLR11 – Model Procedures;
- Contamination and Environmental Matters - Their implications for Property Professionals (2nd Edition RICS Nov 2003);
- Brownfields – Managing the development of previously developed land – A client's guide, CIRIA 2002;
- DEFRA and Environment Agency publications CLR7 – 10, supported by the TOX guides and SGV guides, dated March 2002;
- DETR Circular 02/2000, Contaminated Land: Implementation of Part IIA of the Environmental Protection Act 1990;
- Environment Agency technical advice to third parties on Pollution of Controlled Waters for Part IIA of the EPA1990, May 2002;

Relevant Legislative Documents

The following is a non-exhaustive list of legislative framework documents that has been considered in the production of this report:

- The Environment Act (1995);
- The Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance (2012);
- The Environment Protection Act (1990);
- The Contaminated Land (England) Act (2000);
- Contaminated Land (England) Regulations (2012);
- The Water Resources Act (1991);
- The Pollution Prevention and Control (England and Wales) Regulations (2000);
- The Landfill Regulations (England and Wales) Regulations (2002);
- The Landfill (England and Wales) (Amendment) Regulations (2004);
- Health and Safety at Work Act;



APPENDIX I Limitations

Standard Limitations

This ground investigation was conducted and has been prepared for the sole internal use and reliance of the Client, Stewart Milne Homes. This report shall not be relied upon or transferred to any other parties without the express written authorisation of BSL. If an unauthorised third party comes into possession of this report they rely on it at their risk and the authors owe them no duty of care or skill.

The findings and opinions conveyed via the desk study within this report are based on information obtained from a variety of sources as detailed within this report, which BSL believes are reliable. In addition if information has been used from third parties and in particular other investigations and reports this information has been used in good faith. BSL cannot and does not guarantee the authenticity or reliability of third party information it has relied upon.

The investigation carried out on the site has been conducted to provide the best information and assessment on the ground conditions within site access and budgetary constraints. Exploratory holes only investigate a small area in relation to the overall site area and can therefore only provide a general indication of overall site conditions. Therefore the findings, opinions, geotechnical and environmental recommendations within this report are based on the ground conditions encountered at each location. It should be noted that different ground conditions may exist that have not been identified within this investigation.

The occurrence of and depths to groundwater may vary seasonally due to changes in weather, it should be noted that any observations and recommendations made on groundwater within this report are based on a select number of site visits over a limited period of time and may not be fully representative of groundwater conditions on the site.

Current UK guidance and legislation has been used in the geotechnical and environmental assessment of the site, BSL is not liable for any subsequent changes in the guidance and legislation.

The recommendations within this report are based upon the proposed site end use provided to BSL at the time of the investigation. If the end use or development layout changes from the proposal then the recommendations may change or become invalid.

Although every effort has been made to position exploratory holes in the least sensitive areas of the site, exploratory hole positions were located approximately as part of this investigation and no guarantee can be given as to their accuracy. Consideration should be given to the possibility that exploratory holes excavated as part of this investigation and indeed any previous ground investigation work by others may be encountered beneath or within the influence of individual foundations. BSL cannot be held responsible for structural failures caused by the location of foundations of any form of structure within the influence of exploratory holes.

No existing manhole covers were lifted or drainage runs inspected during the course of this ground investigation. The site plans enclosed in this report should not be scaled off.