

Land East of Drove Lane, Yapton

Interpretative Geotechnical Report

For

Trustees of the Langmead Pension Scheme

Project Number:

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EXECUTIVE SUMMARY AND ACTIONS

SITE LOCATION AND SETTING	The site is located in a rural setting on the western outskirts of the village of Yapton in West Sussex. It comprises agricultural land off Drove Lane, Yapton at a National Grid Reference (NGR) of 497354, 103152. The nearest postcode to the site is BN18 0EB (Drove Lane Farm). The general area is low lying at approximately 2-7m AOD (above ordnance datum) with the site typically residing at 5-6m AOD.
DEVELOPMENT PROPOSAL	The site has planning permission for residential development, including associated hard and soft landscaping.
ENVIRONMENTAL SETTING	The site is underlain by a thin layer of Topsoil / Made Ground into variable clays, silts and sands of the River Terrace Deposits into Undifferentiated Chalk bedrock. The superficial deposits are a classified Secondary A Aquifer and the bedrock is a Principal Aquifer.
CURRENT USE AND HISTORY	Historically the site was used as farmland as is today. Between 1876 and 1912 the Chichester and Arundel Canal was recorded to prominently run across the northern part of the site.
GEOTECHNICAL HAZARDS	The following geotechnical hazards have been identified as being associated with the site: • Compressible deposits • Clays of a low to medium volume change potential • Potential localised deep Made Ground associated with historical canal • Shallow groundwater • The potential for running sand conditions • The potential for chalk dissolution
GEOTECHNICAL RECOMMENDATIONS	Foundations Based on interpretation of factual ground investigations on the site to date, conventional shallow strip / trench fill foundations are considered viable on site if ground improvement is undertaken. Further in-situ testing is required to confirm the feasibility of ground improvement on site. If further testing determines that ground improvement is not feasible within areas of the site then deep piled foundations will be required in these areas. At the time of writing ground improvement in the form of vibro-stone columns and controlled modulus columns are considered the most suitable forms of ground improvement on site. Floor Slabs Suspended floor slabs are recommended on site. Road Pavements Assuming formation soils comprise River Terrace Deposits comprising Clay, a design long term equilibrium CBR value of 3% is recommended. Buried Concrete A concrete classification of DS-1 AC-1 is considered for the site. Drainage Drainage and other services will be affected by any large total or differential settlements. Drainage should be laid with increased falls and flexible service connections may be required. Design of infiltration drainage should take into account shallow groundwater, seasonal variations in groundwater level, chalk dissolution risk and results from infiltration testing. Chalk Dissolution Although not identified on site, the potential for chalk dissolution should be considered during future design phases.
GEOTECHNICAL ACTIONS	Additional ground investigations to investigate the nature of ground conditions associated with the historical canal in the north of the site should this form part of the built development. Chemical groundwater testing to assess how aggressive to buried concrete the groundwater is.

In-situ CBR testing to inform pavement designs.

Cone penetration testing (CPT) on a plot by plot basis in order to establish the extent of the softer zones and obtain more detailed geotechnical parameters in order to inform ground improvement options.

Should further testing show that ground improvement is unfeasible, deep rotary borehole investigations are required to inform pile design.

A geotechnical advisor should be appointed to aid in the design development of the site.

Once structural details of the development are finalised then a Geotechnical Design Report should be prepared.

1.0 INTRODUCTION

1.1. Appointment and Scope

- 1.1.1. This report has been produced by Campbell Reith Hill LLP (CampbellReith) on behalf of the Trustees of the Langmead Pension Scheme (the Client) to summarise environmental and geotechnical information relating to Land East of Drove Lane, Yapton (hereafter referred to as the site). The references and limitations associated with this report follow the main text.
- 1.1.2. The report has been produced in general accordance with the procedures for ground investigation, interpretation and reporting set out in BS 10175:2011 (+A2:2017) and BS EN 1997 (Eurocode 7). The objective of the report is to collate and interpret Phase 1 Desk Study information and Phase 2 exploratory data in order to provide:
- A ground model for the site ground conditions.
 - A geotechnical evaluation.
 - Preliminary geotechnical design recommendations.
- 1.1.3. It should be recognised that further appraisals, investigations, specification and validation may be required to accord with the recommendations stated herein.
- 1.1.4. The report is based on previous and recent site investigations commissioned for the site and a review of readily available information, as referenced.
- 1.1.5. Geo-environmental advice is excluded and is beyond the scope / brief of this report.

1.2. Previous Investigations and Reports

- 1.2.1. The following previous reporting and site investigations have been made available for review and the information contained within has been considered when presenting the recommendations within this report:
- Phase 1 Geo-environmental Desk Study, Land at Drove Lane, Yapton, BRD, April 2017 (Report Reference: BRD2934-OR1-A)
 - Phase 2 Geo-Environmental Site Investigations, Land at Drove Lane Yapton, BRD, November 2017 (Report Reference: BRD2934-OR2-B).

2.0 SITE DESCRIPTION

2.1. Site Location

- 2.1.1. The site is located in a rural setting on the western outskirts of the village of Yapton in West Sussex.
- 2.1.2. The site location plan is presented in Figure 1, Appendix A.
- 2.1.3. It comprises agricultural land off Drove Lane, Yapton at a National Grid Reference (NGR) of 497354, 103152. The nearest postcode to the site is BN18 0EB (Drove Lane Farm).
- 2.1.4. The general area is low lying at approximately 2-7m AOD (above ordnance datum) with the site typically residing at 5-6m AOD.
- 2.1.5. Agricultural land is present to the site's northwest, east / southeast and south and predominantly residential land uses exist to the site's east and northeast.

2.2. Site Layout

- 2.2.1. The site is formed by two adjoining fields separated by a hedgerow. The smaller of the two fields is located in the north, with the larger field forming the majority of the site located to its southwest.
- 2.2.2. A site layout plan is presented in Figure 2, Appendix A.
- 2.2.3. Its northeast boundary is formed of fencing with a hedgerow, its eastern boundary is formed of hedgerows / trees, its western boundary is formed of a ditch and access road and its southwest boundary is understood to be formed by a footpath.
- 2.2.4. It is accessed in the west via Drove Lane.
- 2.2.5. Drainage ditches are present along its eastern, southern and western boundaries.

2.3. Site History

- 2.3.1. In 1876 the site comprised farmland with northwest-southeast striking Chichester and Arundel Canal crossing its northern area. Between 1897 and 1912 the eastern half of the canal appears to have been infilled.
- 2.3.2. Between 1912 and present day the site has remained as farmland, with no notable changes. The footprint of the canal gradually fades from mapping and is labelled as a path by 2017.
- 2.3.3. Today the historical footprint of the canal forms the boundary between the smaller northern field and the remainder of the site.

2.4. Unexploded Ordnance (UXO)

- 2.4.1. In reference to UXO risk maps [2] the site is located in an area of low bombing density.
- 2.4.2. A preliminary review has been made of the UXO risk presented by the site based upon CIRIA C681 ('Unexploded Ordnance (UXO) – A guide for the construction industry') and the assessment matrices presented in Tables 5.1-5.3 therein.
- 2.4.3. Due to the site's rural setting and the recorded bombing density in the area, the site is considered to be at a Low Risk from UXO(s).

2.5. **Tunnels and Infrastructure**

- 2.5.1. In reference to CampbellReith's internal database records – GISSMo (Geographic Information System Site Model), no tunnels are recorded on site.
- 2.5.2. The Portsmouth and Arundel Canal was recorded to historically run between the northern field and the remainder of the site. It is unknown if any infrastructure associated with the canal remains on site.
- 2.5.3. Drainage ditches are understood to be present along the site's eastern, southern and western boundaries.
- 2.5.4. It should be noted that the above review does not constitute a formal review of all buried utilities that may be present at the site.

2.6. **Redevelopment Proposal**

- 2.6.1. The site has planning permission for residential development, including associated hard and soft landscaping.
- 2.6.2. The approved site development layout is shown in Figure 3, Appendix A.

3.0 ENVIRONMENTAL SETTING

3.1. Geology

- 3.1.1. The site is recorded to be overlain by superficial deposits into Undifferentiated Chalk bedrock. The superficial deposits are recorded as Aeolian Deposits ('Brickearth') [1] on 1:50,000 British Geological Survey (BGS) geological mapping and Undifferentiated River Terrace Deposits [2] on online BGS mapping. It is considered that the online mapping represents the newer interpretation of the underlying geology from the BGS.
- 3.1.2. The Littlehampton Anticline is recorded to intercept the north western site boundary, striking northeast / southwest.
- 3.1.3. The below generalised sequence was encountered during previous ground investigations (Report: BRD2934-OR2-B).
- Topsoil / Made Ground up to 0.55m bgl – humic slightly gravelly or slightly sandy silty topsoil into slightly gravelly slightly sandy silty CLAY. Gravel of brick and flint.
 - River Terrace Deposits up to 4.70m bgl – soft to stiff CLAY with variable silt, sand and gravel portions.
 - Chalk up to >5.45m bgl – slightly clayey gravelly SILT or silty GRAVEL of flint and chalk fragments (CIRIA Grade Dm and Dc).
- 3.1.4. It is noted that Made Ground was recorded on a single occasion up to 1.10m bgl during previous investigations adjacent to some offsite garages in the north. This location was also the only location where coal ash formed the gravel constituent of the Made Ground.

3.2. Preliminary Chalk Dissolution Risk Assessment

- 3.2.1. CampbellReith is not aware of any chalk dissolution features within 1000m of the site and none were recorded during previous ground investigations. However, due to the site's topographical and geological setting it is considered to be at Moderate Risk from chalk dissolution.

3.3. Seismicity

- 3.3.1. The national forward to BS EN 1998-1:2004+A1:2013 'Eurocode 8: Design of Structures for Earthquake Resistance – Part 1' states there are no requirements in the UK to consider seismic loading, and the whole of the UK may be considered an area of very low seismicity in which the provisions of EN 1998 need not apply.

3.4. Hydrogeology and Hydrology

- 3.4.1. The site hydrogeology and hydrology are summarised in Table 3.1.
- 3.4.2. Groundwater was encountered during previous investigations between 3.60-3.80m bgl and was monitored between 2.34-3.84m bgl during return monitoring visits over the months of September and October.

TABLE 3.1: Summary of Hydrogeology and Hydrology

Type	Description
River Terrace Deposits	Secondary Aquifer A.
Undifferentiated Chalk	Principal Aquifer.
Source Protection Zones (SPZs)	The site is understood to not be located within a SPZ.
Nearest surface water source	Drainage ditches are understood to be present along the site's eastern, southern and western boundaries.

3.5. Radon

- 3.5.1. The site is located in an area where <1% of homes are above the Action Level for radon and therefore it is considered unlikely that radon protection measures will be required on site.

4.0 **SITE INVESTIGATION**

4.1. **Scope of Works**

- 4.1.1. Ground investigation works were undertaken on behalf of CampbellReith by Harrisons Group Environmental Ltd. The principal objective of these works was to provide information on groundwater and soakage rates to inform the drainage design for the site but geotechnical testing was also scheduled to make best use of the survey effort. The scheduled site work comprised:

Main Phase (12th-14th December 2018)

- 11no. Windowless Sampler Boreholes up to 5.75m bgl

Second Phase (25th-28th March 2019)

- 7no. Shallow Percolation Tests at 0.50m bgl

- 4.1.2. The exploratory hole location plan is presented in Figure 4, Appendix A.

- 4.1.3. The corresponding Factual Ground Investigation Report is contained in Appendix B.

4.2. **Installations and Monitoring**

- 4.2.1. Groundwater and gas monitoring installations were installed in all windowless sampler borehole locations.

- 4.2.2. 5no. rounds of gas and groundwater monitoring rounds were undertaken between December 2018 and April 2019. Monitoring included the historical exploratory locations WS06 and WS10 from previous investigations (Report: BRD2934-OR2-B).

- 4.2.3. The installation details and monitoring results are presented in the Factual Ground Investigation Report. During ground investigations groundwater was encountered between 2.20-4.10m bgl and 1.56-3.54m AOD. During return monitoring visits groundwater was recorded between 0.34-3.98m bgl and 2.24-6.10m AOD.

4.3. **Geotechnical Testing**

- 4.3.1. In-situ geotechnical testing was undertaken and geotechnical samples obtained for geotechnical laboratory testing. The laboratory testing was scheduled by CampbellReith and undertaken by Harrisons Testing Services.

- 4.3.2. The details of the undertaken tests and associated results are presented within the Factual Ground Investigation Report.

5.0 GEOTECHNICAL EVALUATION

5.1. Ground Conditions

- 5.1.1. The ground conditions encountered during the site investigation generally comprised a sequence of Topsoil or Made Ground into Superficial River Terrace Deposits underlain by Undifferentiated Chalk bedrock.

TABLE 5.1: Soil Profile

Stratum	From (m bgl)	To (m bgl)	Maximum Recorded Thickness (m)
Topsoil / Made Ground	0.00	0.15-0.25	0.25
River Terrace Deposits	0.15-0.25	2.90-4.65	4.45
Undifferentiated Chalk	2.90-4.65	5.75+	2.10+

- 5.1.2. The ground model as encountered in Table 5.1 broadly agrees with the conditions anticipated from previous reporting.

5.2. Topsoil / Made Ground

- 5.2.1. Topsoil was recorded up to 0.25m bgl in percolation test pits, with the exception of PO206 in the north of the site. It generally comprised soft locally slightly gravelly CLAY with occasional rootlets.
- 5.2.2. Made Ground representative of topsoil was recorded in all windowless sampler borehole locations up to maximum depths of 0.25m bgl. It general comprised very soft to soft slightly gravelly to gravelly slightly organic CLAY with the exception of WS206 where it comprised very soft slightly gravelly slightly organic clayey SILT. The gravel constituent was of angular to sub-rounded fine to coarse brick and flint.
- 5.2.3. A summary of in-situ and laboratory geotechnical test results is presented in Table 5.2.
- 5.2.4. A sample taken from a described natural CLAY layer was obtained from PO204. During particle size distribution (PSD) testing the sample was recorded to contain brick fragments and therefore is considered to be Made Ground. The results from the PSD test undertaken on this sampler are included within Table 5.2.

TABLE 5.2: Summary of Soil Parameters for Topsoil / Made Ground Deposits

Soil Parameters	Number of tests	Range of results			
Moisture Content (%)	1	26.5			
Particle Size Distribution (PSD) (%)	2	Clay/Silt	Sand	Gravel	Cobbles
		77-91	8-18	1-5	0

5.3. River Terrace Deposits

- 5.3.1. River Terrace Deposits were recorded in all exploratory locations on site underlying Topsoil or Made Ground, with the exception of PO206 where they were recorded from ground level. They

were recorded up to a maximum depth of 4.65m bgl, however, their depth to base was not proven in any of the percolation test pits or in WS201 and WS205. Therefore, the presence of these deposits to depths >4.65m bgl cannot be discounted.

- 5.3.2. River Terrace Deposits generally comprised a bed of very soft to firm CLAY into SILT or loose to medium dense SAND. On an occasion in WS208 a sequence of very soft CLAY into loose to medium dense SAND into gravelly SILT was recorded.
- 5.3.3. A summary of in-situ and laboratory geotechnical test results are presented separately for the CLAY, SAND and SILT beds in Tables 5.3, 5.4 and 5.5 respectively.
- 5.3.4. A single PSD test was undertaken on a sample from a described SILT bed. The results of the test indicate a clayey SAND / GRAVEL. It is therefore considered that the description of SILT beds in field may be incorrect.
- 5.3.5. Two SPT test 'N₆₀' values were recorded beneath a SAND bed in WS201, however no descriptions or samples were obtained for the tested material. These results have been discounted from the subsequent analysis.

TABLE 5.3: Summary of Test Results for Clay River Terrace Deposits

Soil Parameters	Number of tests	Range of results			
Liquid Limit (%)	12	25-43			
Plastic Limit (%)		15-22			
Plasticity Index (%)		10-22			
Modified Plasticity Index %)		9.1-22			
Plasticity		CL-CI			
Volume Change Potential (NHBC)		Low-Medium			
Moisture Content (%)	22	19.0-32.8			
SPT 'N ₆₀ ' Values	23	0-16			
Particle Size Distribution (PSD) (%)	5	Clay/Silt	Sand	Gravel	Cobbles
		44-93	6-54	0-3	0

TABLE 5.4: Summary of Test Results for Sand River Terrace Deposits

Soil Parameters	Number of tests	Range of results			
Moisture Content (%)	1	17.9			
SPT 'N ₆₀ ' Values	8	10-32			
Particle Size Distribution (PSD) (%)	2	Clay/Silt	Sand	Gravel	Cobbles
		30-38	45-48	18-22	0

TABLE 5.5: Summary of Test Results for Silt River Terrace Deposits

Soil Parameters	Number of tests	Range of results			
SPT 'N ₆₀ ' Values	5	0-52			
Particle Size Distribution (PSD) (%)	1	Clay/Silt	Sand	Gravel	Cobbles
		34	32	34	0

5.4. Undifferentiated Chalk

- 5.4.1. Undifferentiated Chalk was recorded to underlie River Terrace Deposits up to exploratory hole completion, where encountered. It was observed to a maximum exploration depth of 5.75m bgl.
- 5.4.2. It was recovered as either structureless CHALK composed of cream to white silty GRAVEL (Dc Grade) or gravelly SILT (Dm Grade). The clasts and gravels were recorded to be moderately weak, predominantly low density, angular to sub-rounded fine to coarse of chalk with frequent flint fragments.
- 5.4.3. In reference to CIRIA C574 [4], dry density and saturated moisture content results indicate low to medium density chalk.
- 5.4.4. A summary of in-situ and laboratory geotechnical test results is presented Table 6.4.
- 5.4.5. Low SPT 'N₆₀' values of <10 were recorded between 3.00-4.00m bgl in the Undifferentiated Chalk and are indicative of the weathering of upper layers of the chalk bedrock.

TABLE 6.4: Summary of Test Results for Undifferentiated Chalk

Soil Parameters	Number of tests	Range of results
Moisture Content (%)	3	22-26
Bulk Density (Mg/m ³)		1.86-1.97
Dry Density (Mg/m ³)		1.51-1.57
Saturated Moisture Content (%)		26.60-29.00
SPT 'N ₆₀ ' Values	18	4-79

5.5. Groundwater Conditions

- 5.5.1. Groundwater was encountered between 2.20-4.10m bgl during ground investigations.
- 5.5.2. During return monitoring visits standing water level was recorded between 0.34-3.98m bgl. At its shallowest standing water level was recorded between 0.34-2.34m bgl in soft to very soft CLAY of the River Terrace Deposits.
- 5.5.3. Based on results, groundwater level is shown to vary seasonally on site.

5.6. Infiltration Rates

- 5.6.1. The feasibility of shallow infiltration drainage was tested on site through percolation tests at 0.50m bgl in the initial CLAY bed of the River Terrace Deposits. The equivalent infiltration rates calculated by Harrisons Group Environmental from percolation test results are summarised in Table 6.5.

TABLE 6.5: Equivalent Infiltration Rates from Percolation Tests

Exploratory Hole	Stratum	Response Zone (m bgl)	Calculated Permeability (m/s)
PO201	Slightly sandy CLAY	0.20-0.50m bgl	6.48×10^{-6}
PO202			7.66×10^{-6}
PO203			9.70×10^{-6}
PO204			2.72×10^{-6}
PO205			8.88×10^{-6}
PO206			8.37×10^{-6}
PO207			2.08×10^{-6}

5.7. Buried Concrete

- 5.7.1. Ten soil samples, comprising nine from the River Terrace Deposits and one from the Undifferentiated Chalk were subjected to pH and water soluble sulphate determinations. With reference to BRE Digest SD1 (2005 Ed), the results indicate DS-1, AC-1 classifications.
- 5.7.2. The above samples were also subjected to total sulphur and acid soluble sulphate content testing to allow an assessment to be made in relation to the potential thaumasite form of concrete attack. None of the oxidisable sulphides values calculated were in excess of 0.3%. Consequently, the results are not considered indicative of significant risk from this form of concrete attack.
- 5.7.3. No groundwater samples were subjected to sulphate and pH determinations.

5.8. Additional Comments

- 5.8.1. Instabilities were recorded in WS208 in Dm Grade Undifferentiated Chalk after a SPT test was undertaken.
- 5.8.2. No obstructions were recorded on site.
- 5.8.3. No exploratory hole locations were progressed within the area understood to form the footprint of the historical canal because there is no built development proposed in this area of the site.

6.0 GEOTECHNICAL CONCLUSIONS AND RECOMMENDATIONS

6.1. Introduction

- 6.1.1. The site has planning permission for residential development with associated soft / hard landscaping. The approved development layout is presented in Figure 3, Appendix A.
- 6.1.2. Details of the structure, proposed layouts and anticipated loadings were under development at the time of the writing of this report, which is based on a preliminary investigation. Further investigation will be required once proposals are fully developed and a detailed Geotechnical Design Report should be prepared. The primary purpose of this report is to identify risk, allow design development and inform cost estimates.

6.2. Key Considerations

- 6.2.1. The following geotechnical risks are considered to be present on site:
- Compressible deposits
 - Clays of a low to medium volume change potential
 - Potential localised deep Made Ground associated with historical canal
 - Shallow groundwater
 - The potential for running sand conditions
 - The potential for chalk dissolution

6.3. Foundations

Shallow Foundations

- 6.3.1. Made Ground is not a suitable founding stratum due to its poor load bearing characteristics.
- 6.3.2. The River Terrace Deposits are variable in nature. SPT 'N60' values of 0 in CLAY and SILT beds indicate the presence of extremely soft beds and field descriptions and SPT values in SAND beds indicate very loose material. Although firm CLAY and medium dense SAND beds are recorded, SPT 'N60' values indicate that extremely soft or very loose beds are present up to 3.00m bgl.
- 6.3.3. It is considered that loose or worse SAND and soft or worse CLAY or SILT horizons are unsuitable founding strata without suitable ground improvement due to their susceptibility to compression.
- 6.3.4. It is considered that firm or better CLAY or SILT and medium dense or better SAND of the River Terrace Deposits may be suitable founding strata, however additional ground investigations would be required in order to further delineate the location of these layers.
- 6.3.5. It is considered that an allowable bearing capacity of 75kPa would be suitable for firm or better CLAY or SILT beds of the River Terrace Deposits, considering a foundation up to 1m width.
- 6.3.6. The presence of shallow groundwater on site will reduce the bearing capacity of granular deposits of the River Terrace Deposits. It is considered that an allowable bearing capacity of 70kPa would be suitable for medium dense or better SAND assuming worst case groundwater at ground level and a maximum foundation width of 1m.

- 6.3.7. The above allowable bearing capacities assume that firm / medium dense bearing strata are present at suitably homogenous thicknesses and depths below formation level. Foundations should not straddle different strata in order to avoid issues with differential settlement. If this is unavoidable, it is recommended that foundations are deepened until homogenous founding strata is reached.
- 6.3.8. The depth of shallow foundations will be governed by the depth to suitable founding strata. It is generally considered that foundation depths in excess of 2.5m bgl are unfeasible from a cost perspective.
- 6.3.9. Undifferentiated Chalk bedrock is recorded on site from 2.90m bgl and therefore it is considered unlikely to be present from a suitable depth to be used as a founding strata for shallow foundations.
- 6.3.10. All foundations should be deepened past any soft or worse and loose or worse deposits. It is noted that in WS204, located in the southeast of the site, the strength of the CLAY reduced with depth. Furthermore, in WS209, WS210 and WS211 in the north of the site, very low strength chalk was recorded to underlie the River Terrace Deposits. Therefore, the presence of unsuitable compressible strata beneath suitable founding strata cannot be entirely discounted and the absence of such should be proven prior to the formation of foundations in order to avoid issues with settlement. Where such compressible strata is encountered it is recommended that foundations are deepened until suitable homogenous founding strata is encountered.
- 6.3.11. Any foundations formed in cohesive soils will require deepening to a minimum of 0.90m bgl in accordance with NHBC Standards Chapter 4.2 [6] based on a low to medium volume change potential, not taking into account the presence of trees or shrubs. Foundations will require further deepening in accordance with NHBC Standards if located within the zone of influence of any trees to be removed / retained / planted and past any zones of desiccation / organic inclusions, if encountered.
- 6.3.12. Heave protection is recommended on site in accordance with NHBC Standards and should be designed based on the low to medium volume change potential of soils on site.
- 6.3.13. Issues with excavation instability in foundation excavations should be taken into account, including the potential for shallow groundwater and running sand conditions. Recommendations for the management of excavation stability are outlined in Section 6.10.
- 6.3.14. Notwithstanding the above, due to the depth and variability weak compressible strata exhibiting SPT 'N60' values of <10 extending up to 4.00m bgl, and the complexities of identifying these weak layers it is considered likely that ground improvement or deep piled foundations will be required on site.

Ground Improvement

- 6.3.15. The use of ground improvement may be considered on site to improve the strength of the River Terrace Deposits.
- 6.3.16. With respect to ground improvement options, the advice of reputable specialist contractors experienced in the ground conditions considered here should be sought prior to detailed design. They should be responsible for the selection of appropriate equipment and the final design of the treatment.

- 6.3.17. The restrictions that would need to be considered by the specialist would include: noise and vibration, organic and other deleterious matter content in the ground, proximity of nearby structures and other sensitive site uses. Specialist contractors may request sight of ground conditions for themselves through trial pits or other investigation methods before the suitability of any given technique can be confirmed.
- 6.3.18. Based on the recorded ground conditions, the River Terrace Deposits may be amenable to treatment by the formation of vibro-stone columns in both cohesive and granular soils. Where significant portions of soft clays are present, use of vibro-concrete columns or controlled modulus columns may be given consideration. Thought may also be given to dynamic compaction in granular soils and lime stabilisation in clay soils.
- 6.3.19. The impact of the chosen ground improvement method on the Undifferentiated Chalk bedrock should be suitably assessed. In reference to C574, the use of vibro-stone columns can result in the formation of liquefied slurry chalk at the toe of the column and settlements may occur when loaded. Furthermore, as the formed columns can act as vertical drains and therefore cause the inundation of water into chalk bedrock there is an added risk of chalk dissolution and collapse settlement, although this is considered less of a risk as head of the chalk is typically below the groundwater table.
- 6.3.20. Although results indicate that ground conditions on site are not particularly aggressive to buried concrete, the use of lime stabilisation should be suitably critiqued if it is proposed as the addition of lime increases soil pH which in turn can heighten risk of aggressive ground conditions and swelling due to the formation of ettringite crystals. Further testing would be recommended to confirm this.
- 6.3.21. A specialist ground improvement was contacted for early contractor involvement advice regarding ground improvement on site. The provided comments were based on a low rise (1-2 storey) residential development, utilising conventional strip footings (0.60-0.75m widths) and suspended floor slabs. They have suggested that treatment with their dry bottom feed system to form vibro stone columns (VSCs) to depths of 3.50-4.00m depths would suitably treat the majority of the site, providing post-treatment bearing pressures of 100kPa. However, where softer zones are present e.g. WS204, WS206 and WS207 along the centre of the site, as indicated through extremely low SPT counts, VSC are not considered suitable as softer zones are unlikely to afford sufficient lateral restraint for column formation. In these softer areas, it was suggested that thought is given to the use of controlled modulus columns (CMCs), which would be envisaged to provide post-treatment bearing pressures of 150kPa.
- 6.3.22. Another ground improvement contractor was also contacted for early contractor involvement in regards to ground improvement on site and also suggested that VSCs may be suitable for areas of the site depending on the extent of soft zones and silt and the presence of chalk bedrock and potential chalk dissolution risk associated with the method. In areas of the site where ground improvement is not suitable they have suggested the use of driven pile pre-cast and beam foundation systems.
- 6.3.23. In order to inform specific ground improvement options on site, it is recommended that cone penetration testing (CPT) is undertaken on a plot by plot basis in order to establish the extent of the softer zones and obtain more detailed geotechnical parameters; in doing so determining suitability and the split between VSC and CMC on site.

- 6.3.24. In regards to chalk dissolution risk associated with VSC, it is envisaged that the risk can be lowered / mitigated through either a blinding layer above the VSC once installed, not penetrating the chalk bedrock with the columns the formation of a mortar / concrete plug at the base of the VSC. Alternatively undertaking all ground treatment using CMCs could be undertaken which would remain cost effective when compared to traditional piling methods.
- 6.3.25. Surcharging is also considered a viable ground improvement option, effective on both soft cohesive and loose granular soils. If chosen, consideration should be given to the surcharge loads in relation to proposed developments, anticipated consolidation time, short term, creep and long term settlement monitoring and groundwater conditions and monitoring.
- 6.3.26. It is noted here that ground improvement does not remove the risk of heave on site and that this should be taken into account with appropriate void formers and appropriate foundation depths as per NHBC guidelines.
- 6.3.27. During design development, should the use of ground improvement be considered unfeasible in areas of the site due to the results from further testing or from an economical point of view, the use of deep piled foundations will be required in these areas.

Deep Piled Foundations

- 6.3.28. The advice of reputable piling specialists, experienced in the ground conditions considered here, should be sought. They should be responsible for the selection of appropriate piling equipment and the final design of the piles. Given below are some preliminary comments to inform pile design.
- 6.3.29. The site is likely to be amenable to either CFA or bored piles and potentially driven piles. The use of driven piles will be subject to allowable levels of vibration and noise within the area.
- 6.3.30. Bored piles would require casing to support the pile bore through the underlying granular strata. Further, there is the risk to bore pile instability from water seepages which will likely require the use of a bentonite slurry or other suitable support fluid.
- 6.3.31. CFA piles are generally limited to 25m for smaller diameter piles (<400mm) and 30m for larger diameter piles (>600mm), which should be taken into account when determining the number of piles under heavily loaded areas. CFA piles require good workmanship to ensure they are adequately constructed.
- 6.3.32. Piled foundations should be designed in accordance with C574 and PR86 [5].
- 6.3.33. In accordance with C574, the chalk on site is considered to be low to medium density and of Dc or Dm grade. The initial rock head of the chalk indicates significant weathering through low SPT 'N60' values.
- 6.3.34. Pile design should take into account the potential for chalk dissolution / differential weathering. Piles should extend past any zones of weakness into competent chalk. The pile designer may consider utilising techniques such as pre-probing, Cone Penetration Tests (CPT's) and / or Super Heavy Dynamic Probing to assess the presence of chalk dissolution at proposed pile locations.
- 6.3.35. The requirements for void formers below ground beams and pile caps, and against the inside faces of external ground beams and pile caps, should be followed in accordance with NHBC Standards.

- 6.3.36. Whilst the specialist piling contractor would be responsible for detailed design, for preliminary guidance, indicative safe working loads for CFA piles constructed from existing ground level are given in Table 8.2. These were undertaken in general accordance with Tomlinson [7], PR86 and C574, however, may require consideration against appropriately factored design actions as detailed in EC7.
- 6.3.37. It is noted that the below ground model and calculations are based on ground investigation information significantly limited by depth, with the maximum depth at which in-situ testing was undertaken being 5.45m bgl. Consequently the ground profile beyond 5.45m bgl has had to be assumed. Consequently should piling be proposed at the site, additional deep rotary core boreholes will be required on site to confirm ground conditions at depth and inform pile design.
- 6.3.38. **Table 8.2: Indicative Safe Working Loads for CFA Piles**

Pile diameter	Safe Working Loads (kN)			
	Pile length			
	10m	15m	20m	30m
300mm	160	300	520	-
450mm	300	560	940	1100
600mm	490	870	1400	1700

- 6.3.39. The estimated Safe Working Loads in Table 8.2 are based on the following assumptions:
- From 0m – 4m bgl Topsoil / Made Ground or very soft CLAY or very loose SAND - no contribution to design resistance.
 - From 4m – 5m bgl weathered Differentiated Chalk = $\beta = 0.45$, $N=4$ and $\Phi = 45^\circ$
 - From 5m – 30m bgl Undifferentiated Chalk, $\beta = 0.45$, $N= 14-50$ and $\Phi = 45^\circ$
 - Groundwater from ground level (0m bgl).
 - The self-weight of the pile and the weight of soil removed/displaced during pile construction approximately cancel each other.
 - Pile spacing of at least 3 x pile diameter.
 - Negative skin friction not accounted for.
- 6.3.40. The adoption of maintained load tests in accordance with EC7 would enable increased capacities or shorter piles to be adopted. The piling specialist may choose to adopt alternative parameters to those outlined above however, their suitability should be verified by an experienced geotechnical engineer.
- 6.4. **Floor slabs**
- 6.4.1. It is recommended that suspended floor slabs are used on site due to the compressible nature of the River Terrace Deposits and the medium volume change potential of associated clay soils.
- 6.5. **Road Pavements**
- 6.5.1. Due to the presence of compressible soils and soils of a volume change potential on site, pavement surfaces should be constructed in flexible materials such as bituminous compounds or

block paving which are more easily able to accommodate ground movement and can be more easily repaired. The formation level should be rolled and inspected for any soft or loose material. These materials should be removed and replaced with granular fill placed and compacted in accordance with suitable specification.

- 6.5.2. Assuming formation soils comprise River Terrace Deposits comprising Clay, a design long term equilibrium CBR value of 3% is recommended.
- 6.5.3. It is recommended that in-situ CBR testing is undertaken on site to confirm the suitability of the above CBR values for use in pavement design.
- 6.5.4. Due to the variability of grain sizes within the River Terrace Deposits and the engineering nature of Made Ground and chalk, all strata on site are considered susceptible to frost heave.
- 6.5.5. It is anticipated that road pavement will require construction on fill in areas where significant depths of compressible strata are present. It is recommended that such fill is placed and compacted in accordance with a suitable specification based on the Specification for Highway Works. Pavement surfaces should be constructed in flexible materials such as bituminous compounds or block paving. The CBR value to be adopted would depend on nature of the fill specification adopted and the as built quality of the fill.

6.6. **Buried Concrete**

- 6.6.1. A concrete classification of DS-1 AC-1 is considered acceptable for ground conditions on site.
- 6.6.2. It is recommended that groundwater samples are obtained and tested to assess the how aggressive groundwater is to buried concrete.

6.7. **Drainage**

- 6.7.1. Drainage and other services will likely be affected by any large total or differential settlements due to the presence of compressible and medium volume change potential soils on site. Drainage should be laid with increased falls and flexible service connections may be required.
- 6.7.2. The design of drainage should take into account the risk of chalk dissolution on site. The point discharge of drainage waters e.g. through soakaways results in the concentration of water ingress into chalk bedrock and can initiate the formation of new dissolution features, or worsening / destabilisation of those already present. It is therefore recommended that any drainage water discharges are designed in accordance with guidance contained in CIRIA C574.

Infiltration Drainage

- 6.7.3. No specific comment on infiltration drainage is made here as the results of ground investigation relevant to surface water drainage have previously been incorporated within the Drainage Strategy for the site (Drawing Reference: 13024-CRH-Z1-SK-00-C-5054-P1).

6.8. **Deep Made Ground and Historical Obstructions**

- 6.8.1. Previous investigations undertaken by BRD in the form of WS01, WS05, WS06 and TP11 were undertaken in proximity to the historical canal. The geological logs associated with these exploration positions did not indicate significant thicknesses of Made Ground / infill material and as such are suspected to have been undertaken outside the canals footprint.

- 6.8.2. Ground conditions associated with the canal's footprint are considered likely to comprise clay rich soils if a clay lining was used for its construction, variable Made Ground associated with infilling and soft / loose sediment with organics associated with its base. Such ground conditions are not considered suitable for load bearing.
- 6.8.3. Obstructions associated with the structure of the canal or its use may also be present and could impede intrusive ground works.
- 6.8.4. Recent ground investigations were not carried out over or in the vicinity of the footprint of the historical canal as it is understood that this area does not form part of the built development. Should this change, it is recommended that further investigations are undertaken to confirm the ground conditions associated with the canals footprint.

6.9. **Chalk Dissolution Features**

- 6.9.1. The site is considered to be at a moderate risk from chalk dissolution based on its geological and topographical setting.
- 6.9.2. No chalk dissolution features were identified during ground investigation works, however, it is noted that such features are locally formed and therefore can be easily missed during intrusive excavations. The presence of unrecorded chalk dissolution features on site therefore cannot be discounted.
- 6.9.3. In reference to C574, it is recommended that if / when chalk dissolution features are encountered, the following treatment techniques are given thought to:
- Excavation of the feature and replacement with compacted suitable material.
 - Bridging of the feature to avoid direct loading.
 - Ground stabilisation / treatment through grouting.
 - Use of piled foundation solutions.
 - Close control of drainage.
- 6.9.4. It may be prudent to further investigate the presence, nature and extent of potential chalk dissolution features on site. Ground investigations may include the use of Super Heavy Dynamic Probes in grids across development footprints.
- 6.9.5. Any further ground investigation should be designed by a suitably qualified person and investigate the presence of chalk dissolution beneath and in the vicinity of proposed structures, including but not limited to foundations, retaining structures and drainage locations.
- 6.9.6. Alternatively, foundations and floor slabs could be designed to span dissolution features.

6.10. **Excavations**

- 6.10.1. It is considered that excavations within the granular beds of the River Terrace Deposits and in the Undifferentiated Chalk cannot be relied on. There is considered to be further risk to excavation stability in the form of running sands where the granular beds of the River Terrace Deposits are water bearing.
- 6.10.2. It is recommended that allowances are be made for shoring / battering faces back to a safe angle of repose and dewatering.

6.11. General Construction Advice

- 6.11.1. It should be possible to use conventional excavators to form excavations in the soils encountered during the investigation. However, use of breaking apparatus may be required in the unlikely event that hard surfacing, old foundations, relict basement construction and the like, are encountered.
- 6.11.2. For any load bearing formations, careful inspection should be undertaken to ensure placement in competent natural strata unless ground treatment has been carried out and properly validated. Any soft spots identified should be excavated and replaced with compacted granular fill or lean mix concrete. Concrete should be placed as soon as possible following excavation to avoid softening of the ground. A similar recommendation is also made for road pavement formations, although compacted granular fill could be used instead of concrete.
- 6.11.3. Any relic foundations or other subterranean structures beneath the footprint of the proposed buildings should be fully grubbed out. Such excavations should be surveyed and backfilled with an acceptable granular fill, placed and compacted to an engineering specification. The same recommendations are made for excavations that may be required to remove soil contamination.
- 6.11.4. In areas of road pavements and hard standing, relic subterranean structures should be broken down to around 1m below finished site level to minimise the risk of differential settlement due to the presence of hard spots. In soft landscaped areas it may be possible to limit such operations to 0.50m bgl.

6.12. Recommendations for Further Work

- 6.12.1. The preceding sections have provided outline preliminary recommendations for the proposed development of the site, however, further investigation and analysis will be required to fully quantify the risks and allow detailed design. Further investigation should comprise:
- Additional ground investigations to investigate the nature of ground conditions associated with the historical canal in the north of the site should this form part of the built development.
 - Chemical groundwater testing to assess how aggressive to buried concrete the groundwater is.
 - In-situ CBR testing to inform pavement designs.
 - Cone penetration testing (CPT) on a plot by plot basis in order to establish the extent of the softer zones and obtain more detailed geotechnical parameters in order to inform ground improvement options.
 - Should further testing show that ground improvement is unfeasible in areas of the site, deep rotary borehole investigations are required to inform pile design.
 - A geotechnical advisor should be appointed to aid in the design development of the site.
 - Once structural details of the development are finalised then a Geotechnical Design Report should be prepared.

TECHNICAL REFERENCES

Reference	Reference Title	Type
[1]	BGS Geological Map 1:50,000 Sheet 317/332 Chichester and Bognor, BGS, 1996.	Geological Map
[2]	BGS Geoindex Onshore Map, BGS, Accessed August 2019 (website: http://mapapps2.bgs.ac.uk/geoindex/home.html)	Online Map
[3]	Zetica UXO Risk Maps, Zetica, Accessed July 2019 (website: https://zeticauxo.com/downloads-and-resources/risk-maps/)	Online Map
[4]	CIRIA 574: Engineering In Chalk, CIRIA, 2002.	Report
[5]	PR86: Shaft friction of CFA Piles in Chalk, CIRIA, 2003.	Report
[6]	NHBC Building Standards, NHBC, 2019.	Standard
[7]	Tomlinson, Foundation Design and Construction, 2001.	Textbook

LIMITATIONS

Environmental & Geotechnical Interpretative Reports

1. This report provides available factual data for the site obtained only from the sources described in the text and related to the site on the basis of the location information provided by the client.
2. Where any data or information supplied by the client or other external source, including that from previous studies, has been used, it has been assumed that the information is correct. No responsibility can be accepted by CampbellReith for inaccuracies within this data or information. In relation to historic maps the accuracy of maps cannot be guaranteed and it should be recognized that different conditions on site may have existed between and subsequent to the various map surveys.
3. This report is limited to those aspects of historical land use and enquiries related to environmental matters reported on and no liability is accepted for any other aspects. The opinions expressed cannot be absolute due to the limit of time and resources implicit within the agreed brief and the possibility of unrecorded previous uses of the site and adjacent land.
4. The material encountered and samples obtained during on-site investigations represent only a small proportion of the materials present on the site. There may be other conditions prevailing at the site which have not been revealed and which have therefore not been taken into account in this report. These risks can be minimised and reduced by additional investigations. If significant variations become evident, additional specialist advice should be sought to assess the implications of these few findings.
5. The generalised soil conditions described in the text are intended to convey trends in subsurface conditions. The boundaries between strata are approximate and have been developed on interpretations of the exploration locations and samples collected.
6. Water level and gas readings have been taken at times and under conditions stated on the exploration logs. It must be noted that fluctuations in the level of groundwater or gas may occur due to a variety of factors which may differ from those prevailing at the time the measurements were taken.
7. Please note that CampbellReith cannot accept any liability for observations or opinions expressed regarding the absence or presence of asbestos or on any product or waste that may contain asbestos. We recommend that an asbestos specialist, with appropriate professional indemnity insurance, is employed directly by the client in every case where asbestos may be present on the site or within the buildings or installations. Any comments made in this report with respect to asbestos, or asbestos containing materials, are only included to assist the client with the initial appraisal of the project and should not be relied upon in any way.
8. The findings and opinions expressed are relevant to those dates of the reported site work and should not be relied upon to represent conditions at substantially later dates.
9. This report is produced solely for the benefit of the client, and no liability is accepted for any reliance placed upon it by any other party unless specifically agreed in writing.

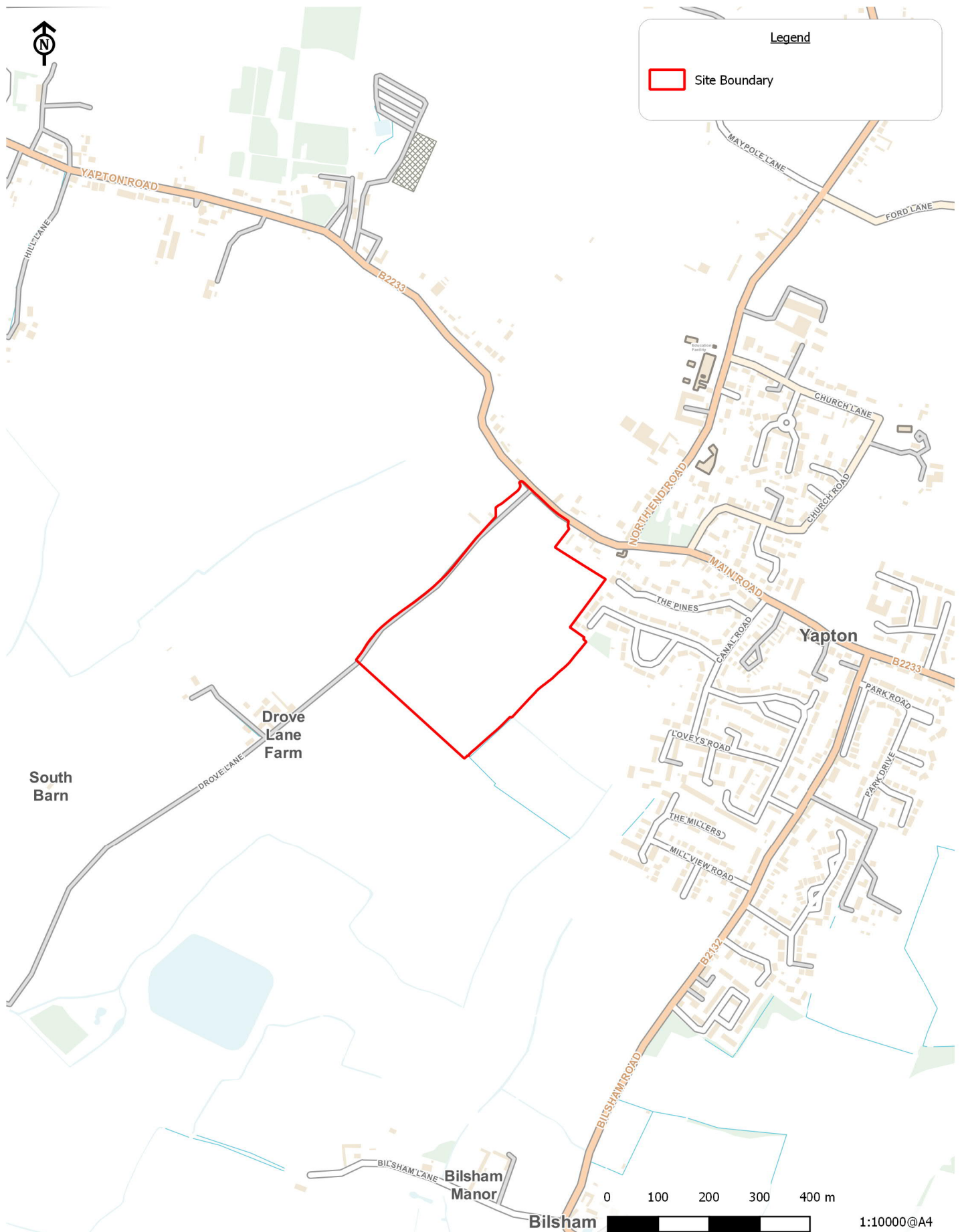
Appendix A: Figures

Figure 1: Site Location

Figure 2: Site Layout

Figure 3: Proposed Development

Figure 4: Ground Investigation Locations



Land East of Drove Lane, Yapton

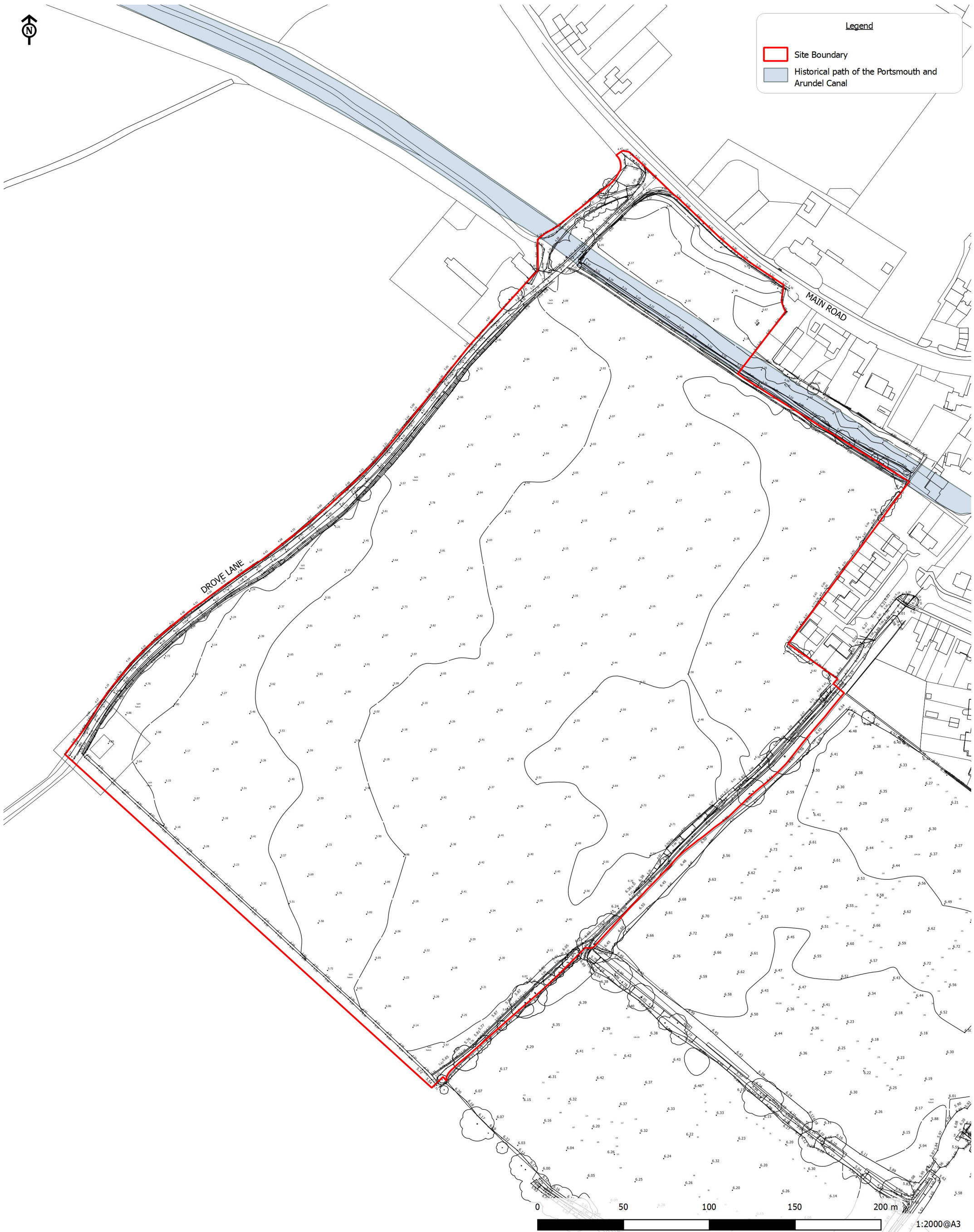
Client: Llandlink Estates

Figure 1:
Site Location Plan

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LONDON 020 7340 1700 ☐ MANCHESTER 0161 819 3060
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Job Number: 13024
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N: 13000 - 13249/13024 R - Land East of Drove Lane Yapton/Project_Workspaces/IGR (pdf in
Date (Revision History):
Outputs

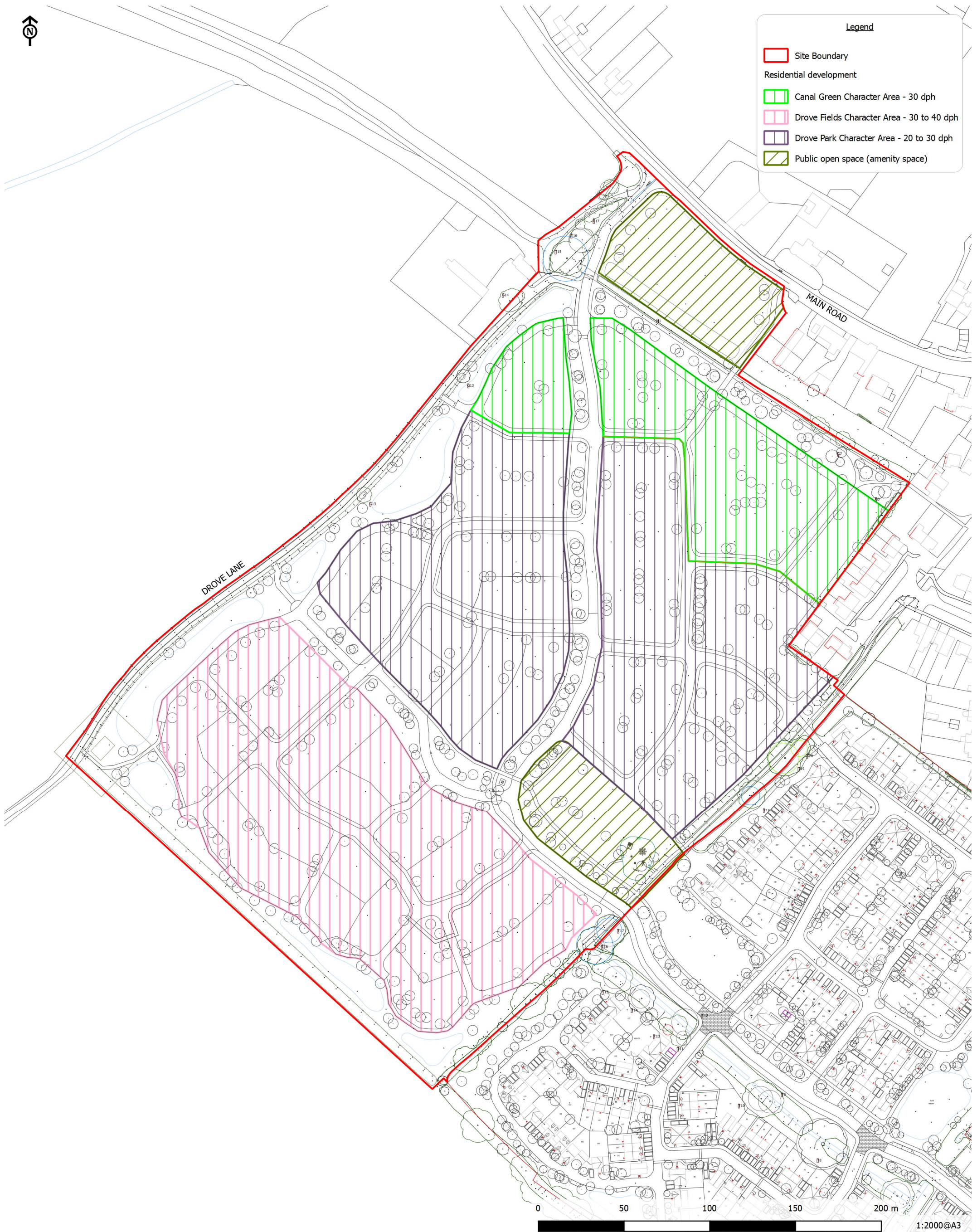


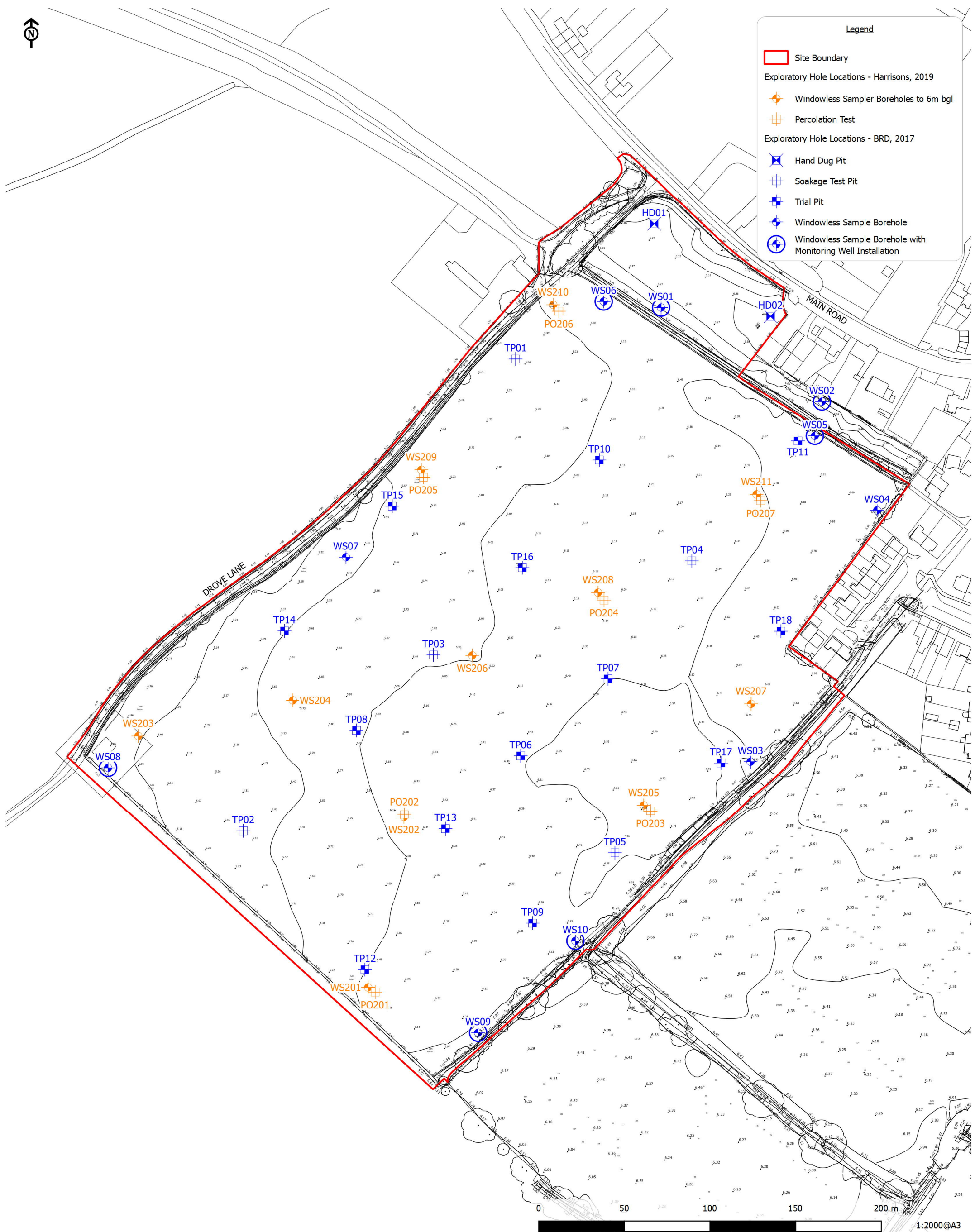
Land East of Drove Lane, Yapton
Client: Landlink Estates

Figure 2:
Site Layout Plan

Scale: 1:2000@A3
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Digital Terrain Surveys LLP Site Survey, drg no DTS160517-7Q0C (Apr 2014); Ordnance Survey provided by Richards Urban
Job Number: 13024
Drawn by - Checked by: RP - TET
Drg No - Status/Revision: GIS006 - A
File location: N:/13000 - 13249/13024 R - Land East of Drove Lane Yapton/Project_Workspaces/IGR (pdf in Outputs)
Date (Revision History): 02/08/2019 (A, First Issue, 02/08/19, RP)

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Land East of Drove Lane, Yapton

Client: Landlink Estates

Figure 4:
Exploration Locations

Appendix B: Factual Report

HARRISON GROUP ENVIRONMENTAL LIMITED

Document: Ground Investigation Factual Report

Project: Land East of Drove Lane, Yapton

Reference No.: GL22428A

Date: April 2019

Prepared For: Trustees of the Langmead Pension Scheme c/o Landlink Estates Ltd.

Engineer: Campbell Reith Hill LLP

REPORT STATUS:

		INIT SIGN	INIT SIGN	INIT SIGN	INIT SIGN
		COMMENTS DATE	COMMENTS DATE	COMMENTS DATE	COMMENTS DATE
		INIT SIGN	INIT SIGN	INIT SIGN	INIT SIGN
		COMMENTS DATE	COMMENTS DATE	COMMENTS DATE	COMMENTS DATE
		INIT SIGN	INIT SIGN	INIT SIGN	INIT SIGN
		COMMENTS DATE	COMMENTS DATE	COMMENTS DATE	COMMENTS DATE
FINAL	REV 1	INIT JS SIGN  COMMENTS DATE 17/04/2019	INIT MC SIGN  COMMENTS DATE 17/04/2019	INIT JS SIGN  COMMENTS DATE 17/04/2019	INIT MC SIGN  COMMENTS DATE 17/04/2019
Revision	Comments	Prepared By	Approved By	Issued By	Audited By

This sheet to be kept on PSI / Report file.

Auditors to insert their comments on the table, to annotate the report itself or provide comments on a separate sheet. (Please state which)

For final reports a hard copy of the signed off form will be kept on the appropriate QA file.



Document: Ground Investigation Factual Report

Project: Land East of Drove Lane, Yapton

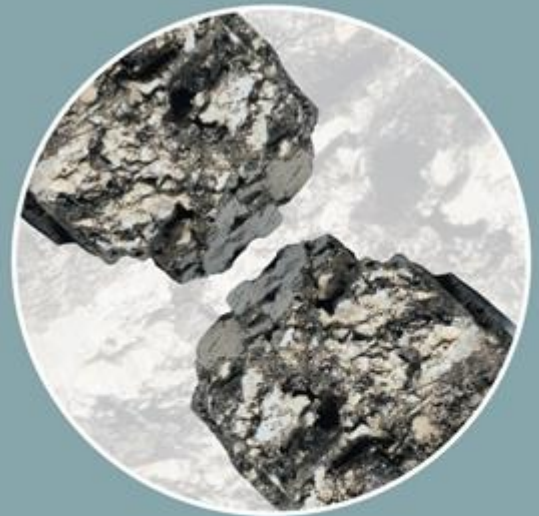
Reference No: GL22428A

Date: April 2019

Prepared for: Trustees of the Langmead Pension Scheme c/o Landlink Estates Ltd

Engineer: Campbell Reith Hill LLP

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REFERENCES

APPENDICES

FOREWORD

General Conditions Relating To Site Investigation

This investigation has been devised to generally comply with the relevant principles and requirements of BS10175:2001+A2:2017 "Investigation of potentially contaminated sites - Code of practice" and where directed by the principles and application rules of Eurocode 7 (EC7 – Part 1 and Part 2). The recommendations made and opinions expressed in this report are based on the information obtained from the sources described using a methodology intended to provide reasonable consistency and robustness.

The opinions expressed in this report are based on the ground conditions revealed by the site works, together with an assessment of the site and of laboratory test results. Whilst opinions may be expressed relating to sub-soil conditions in parts of the site not investigated, for example between exploratory positions, these are only for guidance and no liability can be accepted for their accuracy.

Boring, sampling and field test procedures are undertaken in accordance with BS5930:2015 "Code of Practice for Site Investigations". Likewise in-situ and laboratory testing complies with B.S.1377, "Methods of Tests for Soils for Civil Engineering Purposes", unless stated otherwise in the text.

The groundwater conditions entered on the boring records are those observed at the time of investigation. The normal rate of boring usually does not permit the recording of an equilibrium water level for any one water strike. Moreover, groundwater levels are subject to seasonal variation or changes in local drainage conditions.

Some items of the investigation have been provided by third parties and whilst Harrison Group have no reason to doubt the accuracy, the items relied on have not been verified. No responsibility can be accepted for errors within third party items presented in this report.

This report is produced for the benefit of the client alone. No responsibility can be accepted for any consequences of this information being passed to a third party who may act upon its contents/recommendations.

FACTUAL REPORT
ON A
GROUND INVESTIGATION
AT
LAND EAST OF DROVE LANE, YAPTON

1.0 TERMS OF REFERENCE AND INTRODUCTION

The work covered by this report was undertaken on behalf of Trustees of the Langmead Pension Scheme c/o Landlink Estates Ltd by Harrison Group Environmental Ltd (HGE). The work was undertaken in accordance with the relevant contract documentation and the Campbell Reith Hill LLP (Campbell Reith) Specification for Ground Investigation Tender Document Project (TET-13024-171018). Campbell Reith acted as Consulting Engineer.

The purpose of the investigation was to provide factual geotechnical and geo-environmental data from the fieldwork and subsequent laboratory testing which will be used to assist with the design for the development of the site.

This report presents the results of the fieldwork, associated laboratory testing and post fieldwork monitoring.

2.0 LOCATION AND DESCRIPTION OF SITE

The site is comprised of two adjoining agricultural fields located to the east of Drove Lane, Yapton, Arundel, West Sussex. The north eastern section of the site comprises two indentations around existing residential developments. The site is typically aligned north eastwards and has a total extent of some 12.90 hectares. It is centred on an approximate national grid reference of 497355, 103150 and the nearest postcode to site is BN18 0EB. It is proposed to develop the site with residential housing and associated landscaping and access.

A site location plan (GL22428A-DR001) is presented in Appendix A.

3.0 EXPECTED GEOLOGY

The site is predominantly underlain by Top Soil, with Made Ground up to 1.10mbgl locally, moving into River Terrace Deposits up to 4.70mbgl and in turn the Lewes Nodular Chalk Formation, observed up to 5.45mbgl.

4.0 FIELDWORK

The scope of the site works was generally in accordance with that proposed by Campbell Reith and comprised the following:

- Utility clearance of the exploratory locations (carried out by Midland Surveys Ltd)

- Dynamic Continuous Sampling (Windowless Sampler) Boreholes (11 No. to maximum depth of 5.75mbgl)
- Hand Dug Percolation Testing Pits. (7 No. to depth of 0.50m)
- Gas and groundwater monitoring of installations (5 No. monthly rounds completed)
- Decommissioning of window sample boreholes

The main intrusive fieldwork was carried out by HGE between the 12th and 14th December 2018, Percolation testing was carried out between 25th – 28th March 2019 and the window sample holes were decommissioned on the 3rd April 2019. All exploratory locations are detailed on the appended drawing GL22428A - DR002 Rev B presented in Appendix A.

In addition to consulting all available service plans, lifting all available covers and prior to intrusive activities taking place, service clearance was carried out using Ground Penetrating Radar (GPR). Service inspection pits were also dug at borehole locations to clear near surface utilities.

The sampling strategy was designed by CampbellReith and took into account local site constraints, topography of the site, the geology encountered, including made ground and the development proposals.

During and immediately following completion of the fieldwork geotechnical samples were transported to Harrison Group Geotechnical Laboratory via in house transportation where, upon arrival, they were logged into a sample management system. Following receipt of the CampbellReith geotechnical schedules, certain geotechnical samples were subsequently dispatched to laboratory subcontractors via a courier.

4.1 Dynamic Continuous Sampling (Windowless Sampler) Boreholes

11 No. dynamic sampler boreholes, WS101 through to WS111 were drilled between 12th and 14th December 2018 using a dual-purpose tracked rig. Each position was progressed to a depth of between 4.90mbgl and 5.75mbgl, in order to identify, sample and test the underlying sub-soils.

Upon completion, WS202, WS208, WS210 and WS211 were installed with combined groundwater and gas monitoring wells (50mm), as summarised in Table 4.2. The remaining 7 holes (WS201, WS203, WS204, WS205, WS206, WS207 and WS209) were installed with 19mm groundwater monitoring wells as summarised in Table 4.2.

A detailed description of all the strata encountered, in-situ testing undertaken, position and types of samples taken along, with any groundwater observations made at the time of drilling are included on the dynamic sampling borehole records presented in Appendix B.

4.2 Percolation Testing

7 No. percolation tests were carried out between 25th and 28th of March 2019 and 1 further test on the 3rd of April. The tests were conducted in hand dug pits (PO201-PO207) in accordance with BS 6297:2007+A1:2008 at locations set out by the engineers (Campbell Reith Hill LLP) that were in turn GPS located and service cleared by an independent specialist.

The pits were dug to 0.50m bgl (0.30m x 0.30m LxW) then filled with water to ground level and allowed to drain completely to saturate the ground before the tests were carried out as specified in the relevant code of practice. Table 4.2 on the following page summarises the results.

Test Type and Reference	Number	Results Average Vp of 3 tests (Vp = s/mm)	Comments / Limitations
Percolation test (BS 6297:2007:A1:2 008)	7	12.39 – 62.91	Vp varied across the site with PO204, a relatively central position at the site, being the fastest to drain and PO201 at the southern boundary of the site being the slowest. All positions but PO204 fall within the acceptable Vp range of 15-100. Drainage field disposal should only be used when percolation tests indicate average values of Vp between 15 and 100 and the preliminary assessment of the trial hole is favorable. A value of 15 ensures untreated effluent cannot percolate too rapidly and potentially result in groundwater pollution. Where Vp is above 100 effective treatment is unlikely to take place in a drainage field and potentially cause ponding of wastewater due to insufficient soakage.

Table 4.2: Summary of Percolation tests

A detailed description of all the strata encountered, position and types of samples taken, along with any groundwater observations made at the time of digging are included on the hand dug trial pit records presented in Appendix B. Detailed results of the percolation tests are presented in Appendix E.

4.3 Installations

All boreholes were installed with standpipes for monitoring the gas and groundwater within the soils encountered. Table 4.2 below summarises these installations.

Monitoring Point I.D	Diameter of Installation (mm)	Base Depth of Installation (mbgl)	Response Zone (mbgl)	
			Top	Base
WS201	19	4.80	1.00	4.80
WS202	50	4.80	1.00	4.80
WS203	19	5.00	1.00	5.00
WS204	19	5.70	1.00	5.70
WS205	19	5.70	1.00	5.70
WS206	19	5.00	1.00	5.00
WS207	19	5.00	1.00	5.00
WS208	50	4.40	1.00	4.40
WS209	19	5.90	1.00	5.90
WS210	50	5.00	1.00	5.00
WS211	50	5.00	1.00	5.00

Table 4.3: Summary of Gas and Groundwater Installations.

Detailed descriptions of the installations and their corresponding backfill materials are included on the relevant exploratory borehole logs presented in Appendix B.

4.4 Surveying

Pre-intrusive works were undertaken by an independent specialist who cleared proposed exploratory locations utilising a range of techniques including Ground Penetration Radar (GPR).

The service cleared locations were also surveyed in to establish the coordinates of all exploratory positions, the details of which are shown on the appropriate records presented in Appendix B.

4.5 Gas and Groundwater Monitoring

4 rounds of gas and groundwater monitoring have been undertaken on the HGE borehole installations on the following dates:

- Round 1 – 21st December 2018
- Round 2 – 8th January 2019
- Round 3 – 5th February 2019
- Round 4 – 6th March 2019
- Round 5 – 3rd April 2019

The results of the water strikes encountered during the intrusive works are detailed on the relevant logs presented in Appendix B. The standing groundwater water levels from the subsequent monitoring rounds detailed above are presented in Appendix C.

Gas monitoring was also undertaken on the above dates including one following a fall in atmospheric pressure (date to be confirmed). Concentrations of oxygen, methane, carbon dioxide, carbon monoxide and hydrogen sulphide were measured using a GA5000 land gas analyser. Concentrations of volatile organic compounds (VOCs) were monitored using a Tiger Particle Ionisation detector (PID). The results are presented in Appendix C.

5.0 GEOTECHNICAL TESTING

Use of the laboratory and field tests presented below to establish geotechnical parameters should be carried out in accordance with BS EN 1997-2 Eurocode Part 2.

5.1 In-Situ Testing

In-Situ testing was undertaken for geotechnical purposes and samples were obtained for appropriate laboratory analysis. Site based geotechnical testing is presented in the Appendix B and summarised below (Table 5.1).

Test Type and Reference	Number	Comments / Limitations
Standard penetration test (BS EN ISO 22476-3:2005)	56	Standard Penetration Tests (SPTs) display a general trend of increasing in value with depth below ground level. Non calibrated SPT hammers can result in a wide variance between reported results. It should be noted we report raw SPT N values rather than corrected $N_{(60)}$ values. However, calibration certificates are provided in Appendix F so as to enable $N_{(60)}$ values to be calculated if required.

Table 5.1: Summary of In-Situ Geotechnical Testing

The dynamic continuous sampler (windowless sampler) borehole SPT Hammer Test Report (SPT Hammer Ref: 382709 / 87.82%) are presented in Appendix F.

5.2 Geotechnical Laboratory Testing

Geotechnical laboratory testing scheduled by Campbell Reith on selected soil samples recovered from the exploratory holes, was carried out to identify the physical characteristics of the soils encountered. A summary of the results can be found Below (Table 5.2).

Test Type and Reference (BS 1377: 1990 unless stated)	No of tests	Results (Range)	Comments / Limitations
Water Content (BS EN ISO 17892-1: 2014)	24	17.9 - 32.8%	Determinations on disturbed samples, including those obtained from dynamic continuous sampler boreholes may not be wholly representative due to disturbance arising from the sampling process.
Liquid Limit (Part 2:5)	12	25 -43%	Only material passing a 425micron sieve is utilised. Therefore, the results may not be wholly representative of in-situ material.
Plastic Limit (Part 2:5)		15 - 22%	Determinations on disturbed samples, including those obtained from dynamic continuous sampler boreholes may not be wholly representative due to disturbance arising from the sampling process.
Particle size distribution - wet sieving (Part 2:9.3)	10	-	The recovery of an adequate mass of coarse-grained soils for particle distribution analysis can be difficult in boreholes. In obtaining such samples from cable tool boreholes it should also be noted that some loss of fine material generally occurs due to the nature of the sampling process.
Saturation Moisture Content	3	26.6 - 29%	The absence of suitable sized chalk 'lumps' limits the locations at which intact dry density tests can be performed, with more competent material being preferentially tested. 12 tests scheduled – 9 restricted due to above.
Intact Dry Density		1.51 - 1.57 mg/m ³	
pH	10	7.8 - 8.7	Determination of pH in soil by addition of water followed by automated electrometric measurement.
Water Soluble Sulphate	10	0.0073 - 0.015g/l	Determination of water-soluble sulphate by ICPOES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).
Acid Soluble Sulphate (Total)	10	0.020 - 0.044%	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.
Total Sulphur	10	0.006 - 0.015%	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.

Table 5.2: Summary of Geotechnical Laboratory Testing

Report Compiled by:



Joe Sparks BSc (Hons) MSc
Graduate Geotechnical Engineer

Report Checked by:



Martin Cooper BEng (Hons) FGS
Principal Engineer

REFERENCES

BSI British Standard, BS5930:2015 "Code of Practice for Site Investigations".

BSI British Standard, BS1377:2016, "Methods of Test for Soils for Civil Engineering Purposes".

BS EN ISO 17892-1: 2014 Geotechnical investigation and testing. Laboratory testing of soil. Determination of water content.

BS EN 1997-1 Eurocode 7 Part 1 "General Rules"

BS EN 1997-2 Eurocode 7 Part 2 "Ground Investigation and Testing"

BS EN ISO 22475-1:2006 & 22475-2/3:2011 Geotechnical investigation and testing. Sampling methods and groundwater measurements.

BS EN ISO 22476:2005+A1:2011 Geotechnical investigation and testing. Various.

BS EN ISO 14688-2:2004 Geotechnical investigation and testing. Identification and classification of soil. Principles for a classification.

BS 6297:2007+A1:2008 "Code of practice for the design and installation of drainage fields for use in wastewater treatment".

BRE Special Digest 1:2005 Concrete in Aggressive Ground.

LIST OF APPENDICES

APPENDIX A: DRAWINGS

Site Location Plan - GL22428A-DR001

Exploratory Location Plan – GL22428A-DR002 Rev B

APPENDIX B: EXPLORATORY HOLE RECORDS

Data Sheet: Site Investigation Methods

Key to Site Investigation Records

Dynamic Sampling (Windowless Sampler) Borehole Records

Hand Dug Trial Pit Records for Percolation Testing

APPENDIX C: GAS & GROUNDWATER MONITORING RECORDS

- Round 1 - 19th December 2018
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- Round 2 – 8th January 2019
- Round 3 – 5th February 2019
- Round 4 – 6th March 2019

APPENDIX D: LABORATORY TESTING

Geotechnical Laboratory Test Results

Summary of Restricted Tests

GL22428A-01 - Test Report Transmittal

GL22428A-02 – Test Report Transmittal

19-24225-1 (i2 Analytical)

APPENDIX E: PERCOLATION TESTING

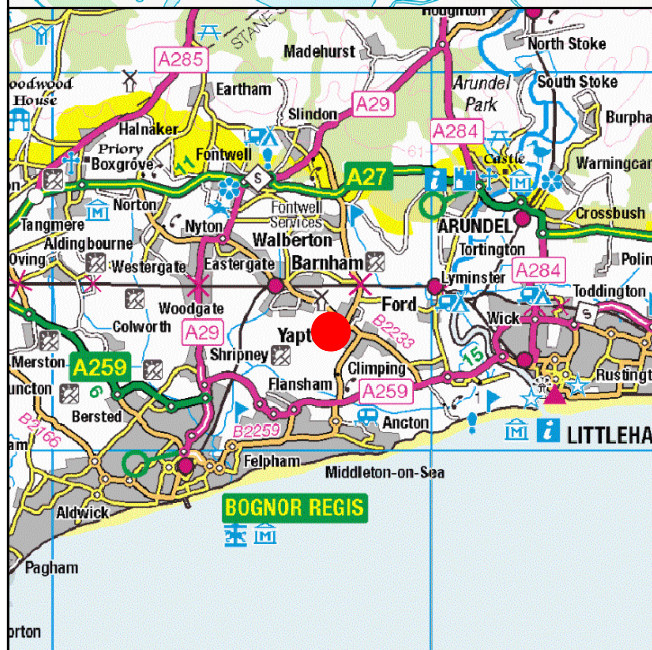
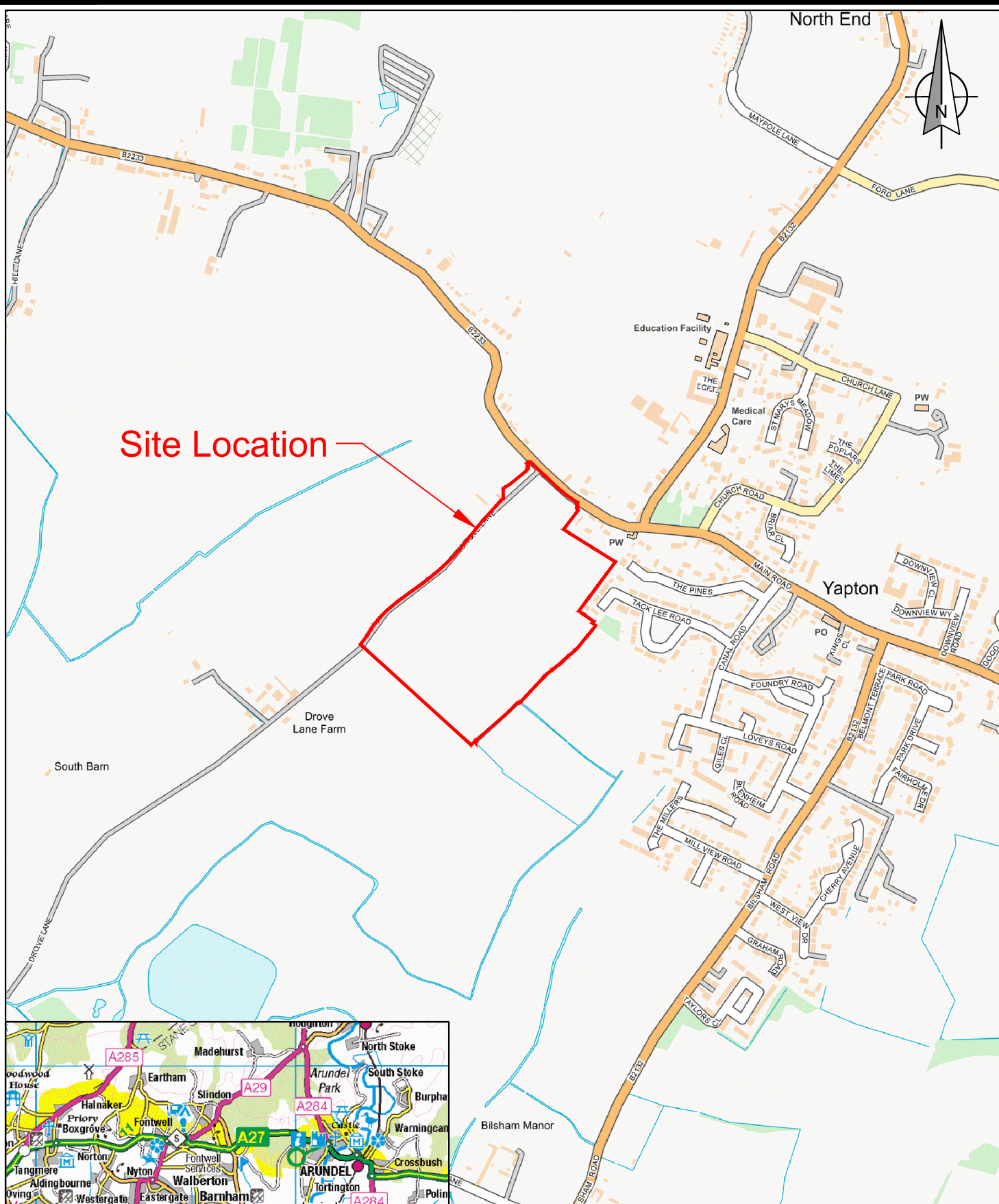
Percolation Testing Results

APPENDIX F: SPT HAMMER CERTIFICATES

SPT Hammer Certificates

APPENDIX A

DRAWINGS

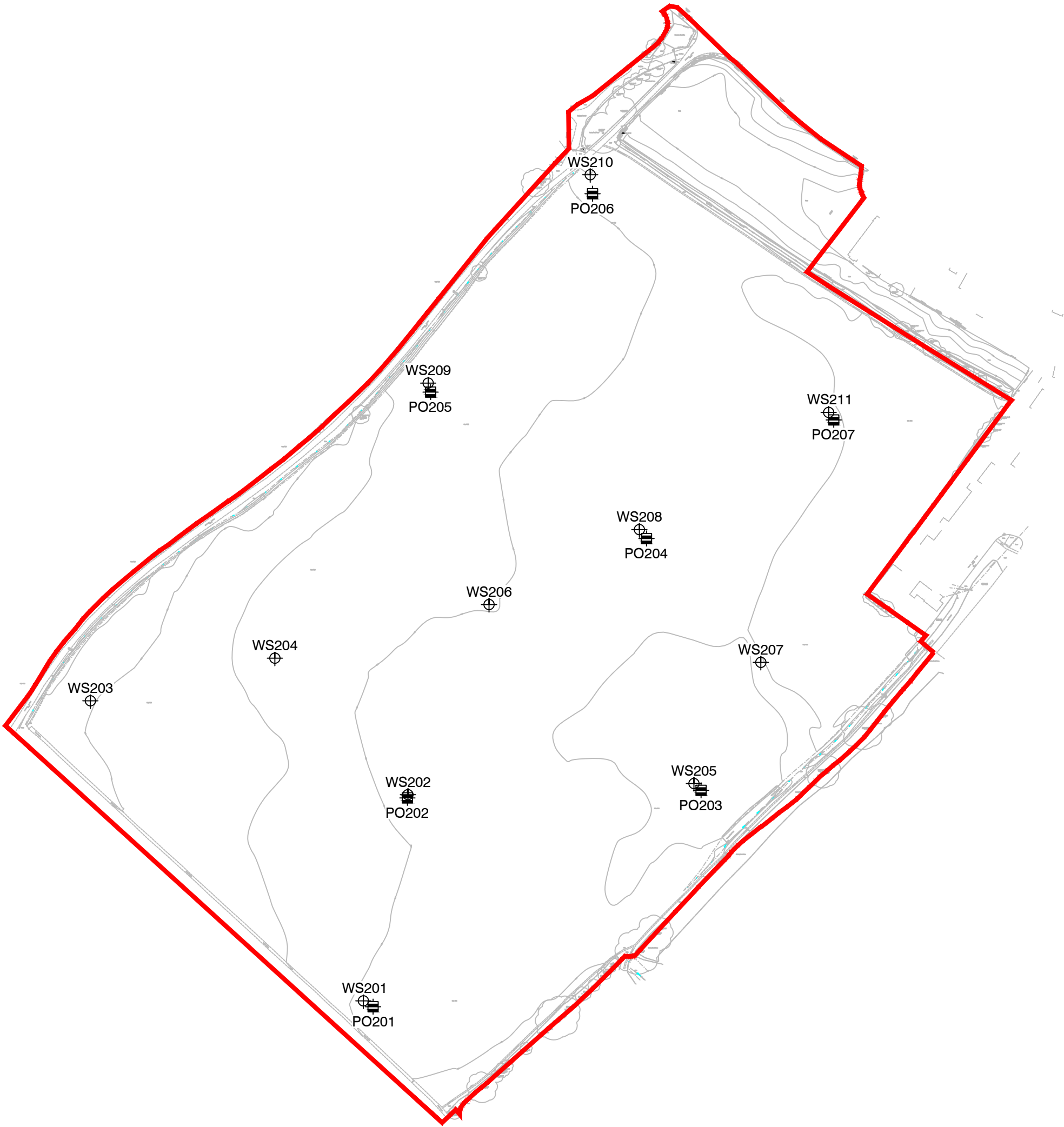
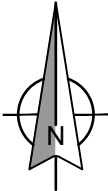


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Project : Drove Lane, Yapton	
Job No : GL22428	Date : December 2018
Drawing No : GL22428A - DR001	
Scale : 1:10000 @ A4	
Drawn by : CS	Checked by : IR
Eastings : 497347	Northings : 103144
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Norwich: 01603 613111 London: 020 7537 9233
Cambridge: 01223 781585 Laboratory: 01603 416333

Email: info@harrisingroupuk.com
Website: www.harrisingroupuk.com

Certificate Number 5933
ISO 9001, ISO 14001



Key :

-  Site Boundary
-  WS201 Dynamic Continuous Sampling Borehole
-  PO201 Percolation Test

Notes :

Client : Trustees of the Langmead Pension Scheme		
Project : Drove Lane, Yapton		
Job No : GL22428	Date : March 2019	
Drawing Title : Fieldwork Location Plan		
Drawing No : GL22428A - DR002		
Scale : 1:2000 @ A3		
Drawn by : CS	Checked by : IR	
Eastings : 497347	Northings : 103144	
Revision history		
Rev	Date	Revision Data
A	12/2018	First issue
B	03/2019	Added percolation tests



Norwich: 01603 613111 London: 020 7537 9233
Cambridge: 01223 781585 Laboratory: 01603 416333

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Certificate Number 5933
ISO 9001, ISO 14001

4031

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APPENDIX B

EXPLORATORY HOLE RECORDS

DATA SHEET: SITE INVESTIGATION METHODS

The following sheet provides basic details of the site investigation methods employed in the direct investigation phase of this report. Detailed method statements may be provided if requested or further information may be obtained from the relevant British Standard or Environment Agency publications. Prior to any excavation being undertaken, a surface sweep using a cable detector is undertaken, in order to avoid services. Details of the lithology encountered are generally presented on the relevant field record sheets, which also detail the type and depths of samples taken, the results of any in-situ tests, and any groundwater observations noted at the time. Other pertinent information may also be recorded.

DYNAMIC CONTINUOUS SAMPLING (WINDOW SAMPLER) BOREHOLES

The window sampler system comprises a series of varying diameter (100mm down to 36mm) steel tubes of either 1m length, and in the case of window (rather than windowless) having a slot or window cut along the side. The tubes are driven into the ground using a light percussive hammer attached to solid rods, and withdrawn by use of a jack. The hammer may be machine mounted (wheeled or tracked) or for restricted access work, hand held. The soil sample is forced up into the tube during the driving, samples being obtained directly through the slot or window, or in the case of windowless, in plastic liners in the steel tube. The sampler generally achieves depths of around 5m in favourable soils. Use of a super heavy tracked rig allows samples to be retrieved in liners to depths of up to 10m in suitable ground conditions.

Sampling can be carried out from the boreholes in accordance with BS EN ISO 22475-1:2006 and SPT testing can be undertaken in accordance with BS EN ISO 22476-3:2005+A1:2011. In addition, small diameter standpipes/monitoring wells can be installed to facilitate the sampling and monitoring of gas and groundwater.

MONITORING WELL INSTALLATIONS

All types of boreholes can be fitted with monitoring wells to enable subsequent sampling and monitoring of groundwater and ground gas levels. Monitoring wells are usually of upvc or hdpe material, although steel may also be used in certain circumstances. Various diameters are available from 19mm upwards, depending upon the size of the borehole. 38mm or 50mm diameter wells are the most commonly used. Wells generally have slotted lower sections which may have a geomesh filter and then are surrounded with a filter medium such as single sized gravel. The upper sections are generally solid casing which is usually grouted to produce a seal with the surrounding ground. The top of the well is generally fitted with a removable cap that may include a gas valve to enable future gas monitoring. The installation is usually protected by a lockable cover set in a concrete base. Details of monitoring well installations and associated backfill are given on the relevant borehole records.

GROUNDWATER MONITORING

Groundwater monitoring is undertaken using an electronic dip meter, which records the depth to water in a standpipe or monitoring well. Alternatively, down-hole pressure transducers can be utilised which can record variations over an extended period, which is particularly useful in monitoring variations due to tidal influences or when undertaking permeability tests or draw down tests or when undertaking soakaway testing. Where a non-aqueous phase liquid (e.g. floating hydrocarbon layer) is present, an interface meter is utilised to measure the thickness.

GROUND GAS MONITORING

Ground gas composition and flow monitoring may be undertaken where monitoring wells have been installed. Both flow (litres per hour) and composition (%) are measured using a portable infra-red multi-gas meter, calibrated for methane, carbon dioxide, carbon monoxide, hydrogen sulphide and oxygen. Records are also taken of atmospheric pressure, and relative pressure. The results are presented in the appendix of the report on the relevant records.

Ground gas monitoring can also be undertaken on a continuous basis using in-situ GasClam instrumentation where specific projects warrant accurate identification and quantification of the ground gas regime.

					Dynamic Continuous Sampling Borehole Record					WS202		Sheet 1 of 2	
Project ID: GL22428A					Client: Trustees of the Langmead Pension Scheme					E: 497284.93		N: 103045.78	
Location: Land East of Drove Lane, Yapton					Consultant: Harrison Group Environmental Ltd					Date: 13/12/2018			
					Plant used: Premier Tracked 110 Rig					SPT Hammer Serial No: 382709 (ER: 88%)			
Geology Description					Legend	Depth (m)	Elevation (maOD) 6.14	Sample / In-Situ Test Information			Casing (Water)	Installation & Backfill	
								Type	Depth	Results / Remarks			
MADE GROUND. Very soft brown gravelly slightly organic CLAY. Gravel is angular to subrounded fine to coarse brick and flint. Very soft orangish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse flint.						0.20	5.94	D1	0.10	N=7 (1,1/1,1,2,3)	-		
								B1	0.50				
								D2	0.50				
								SPT(C)	1.00				
								D3	1.00				
								D4	1.50				
								SPT(C)	2.00				
								D5	2.00				
								D6	2.50				
								SPT(C)	3.00				
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D8	3.50												
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SPT(C)	150.50												
D158	151.00												
SPT(C)	151.50												
D159	152.00												
SPT(C)	152.50												
D160	153.00												
SPT(C)	153.50												
D161	154.00												
SPT(C)	154.50												
D162	155.00												
SPT(C)	155.50												
D163	156.00												
SPT(C)	156.50												
D164	157.00												
SPT(C)	157.50												
D165	158.00												
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D168	161.00												
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SPT(C)	167.50												
D175	168.00												
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D177	170.00												
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SPT(C)	184.50												
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SPT(C)	185.50												
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SPT(C)	186.50												
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SPT(C)	191.50												
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SPT(C)	223.50												
D231	224.00												
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SPT(C)	245.50												
D253	246.00												
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D254	247.00												
SPT(C)	247.50												
D255	248.00												
SPT(C)	248.50												
D256	249.00												
SPT(C)	249.50												
D257	250.00												
SPT(C)	250.50												
D258	251.00												

Dynamic Continuous Sampling Borehole Record

WS203

Sheet 1 of 1

Project ID: **GL22428A**

Client: Trustees of the Langmead Pension Scheme

E: 497129.58 N: 103091.73

Location: Land East of Drove Lane, Yapton

Consultant: Harrison Group Environmental Ltd

Date: 14/12/2018

Plant used: Premier Tracked 110 Rig

SPT Hammer Serial No: 382709 (ER: 88%)

Geology Description	Legend	Depth (m)	Elevation (maOD) 4.96	Sample / In-Situ Test Information			Casing (Water)	Installation & Backfill	
				Type	Depth	Results / Remarks			
MADE GROUND. Very soft brown slightly gravelly slightly organic CLAY. Gravel is subangular to subrounded fine and medium brick and flint. Soft orangish brown slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse flint.		0.20	4.76	D1	0.10	N=6 (1,1/1,1,2,2)	-		
				B1 D2	0.50 0.50				
				SPT(C) D3	1.00 1.00				
				D4	1.50				
Orangish brown mottled light grey very gravelly SILT. Gravel is angular to subrounded fine to coarse chalk and flint. <i>From 2.40m to 2.50m: Band of flint cobbles.</i>		2.15	2.81	SPT(C) D5	2.00 2.00	N=8 (1,1/1,2,2,3)	-		
				D6	2.50				
Recovered as structureless CHALK composed of cream to white slightly gravelly SILT. Gravel is weak to moderately weak, medium density, white, angular to subrounded fine to coarse chalk. (Grade Dm)		2.90	2.06	SPT(C) D7	3.00 3.00	N=4 (0,0/0,1,1,2)	-		
				D8	3.50				
Drilled through by SPT rod only. No recovery		4.00	0.96	SPT(C) D9	4.00 4.00	N=20 (1,1/2,5,7,6)	-		
				SPT(C)	4.45				N=23 (4,5/6,6,5,6)
Borehole completed at 5.00m.		5.00	-0.04						

Window or Windowless Sampling Run Details					Water Strike						
Diameter (mm)	Top Depth (m)	Base Depth (m)	Sample Length (m)	Recovery (%)	Date	Strike Depth (m)	Depth Sealed (m)	Casing Depth (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
85	1.20	2.00	0.80	100	14-12-2018	3.40			20	2.20	Remarks: 1. Inspection pit from GL to 1.20m. 2. SPT rod drilled from 4.00m to 5.00m to allow installation of 19mm standpipe. Two SPT tests detailed for the continuous depth drive. 3. Installation: 19mm standpipe GL to 1.00m plain, 1.00m to 5.00m slotted, fitted with cap and tophat cover. 4. Backfill: GL to 0.20m concrete, 0.20m to 1.00m bentonite pellets, 1.00m to 5.00m gravel.
75	2.00	3.00	1.00	100							
65	3.00	4.00	1.00	100							

Norwich Office: 01603 613111
London Office: 020 7537 9233
Cambridge Office: 01223 781585
Testing Services: 01603 416333

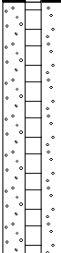
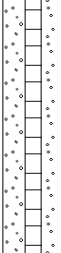
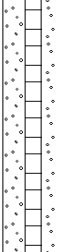
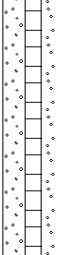
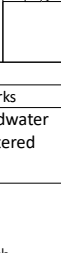
E-mail: info@harrisingroupuk.com
Website: www.harrisingroupuk.com

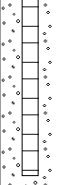
Drilled by: S. Bellchambers

Logged by: I. Reid

Checked by: M. Cooper

Fm-Hn-R-3068-Rev C

					Dynamic Continuous Sampling Borehole Record					WS204		Sheet 1 of 2		
Project ID: GL22428A					Client: Trustees of the Langmead Pension Scheme					E: 497219.84 N: 103112.59				
Location: Land East of Drove Lane, Yapton					Consultant: Harrison Group Environmental Ltd					Date: 13/12/2018				
					Plant used: Premier Tracked 110 Rig					SPT Hammer Serial No: 382709 (ER: 88%)				
Geology Description				Legend	Depth (m)	Elevation (maOD)	Sample / In-Situ Test Information			Casing (Water)	Installation & Backfill			
TOPSOIL. Very soft brown slightly gravelly CLAY. Gravel is subangular to rounded fine and medium flint. Soft orangish brown slightly gravelly CLAY. Gravel is subangular to rounded coarse flint.					0.15	5.52	Type	Depth	Results / Remarks	-				
							D1	0.10						
							B1 D2	0.50 0.50						
							SPT(C) D3	1.00 1.00	N=5 (1,1/1,1,1,2)					
Light orangish brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine and medium chalk and flint.					1.55	4.12	D4	1.50		-				
							SPT(C) D5	2.00 2.00	N=10 (1,1/2,2,3,3)					
							D6	2.50						
							SPT(C) D7	3.00 3.00	N=0 (0,0/0,0,0,0)					
Soft orangish brown mottled grey slightly sandy CLAY with occasional gravel of subangular to subrounded fine flint.					2.55	3.12	D8	3.50		-				
							SPT(C) D9	4.00 4.00	N=17 (1,1/2,3,4,8)					
							D10	4.40						
							D11 SPT(C)	4.70 4.80	N=27 (3,4/4,5,6,12)					
Medium dense orangish brown mottled grey slightly gravelly fine and medium SAND. Gravel is subangular to subrounded fine flint. From 4.10m: Becoming very gravelly. Chalk present in gravel.					3.80	1.87				-				
Recovered as structureless CHALK composed of cream to white silty GRAVEL. Clasts are moderately weak, low density, white, angular to subangular fine to coarse chalk with frequent flint					4.60	1.07				-				
					4.80	0.87								
Window or Windowless Sampling Run Details					Water Strike									
Diameter (mm)	Top Depth (m)	Base Depth (m)	Sample Length (m)	Recovery (%)	Date	Strike Depth (m)	Depth Sealed (m)	Casing Depth (m)	Time Elapsed (mins)	Standing Level (m)	Remarks			
85	1.20	2.00	0.80	100						3.60	No groundwater encountered			
75	2.00	3.00	1.00	100										
65	3.00	4.00	1.00	100										
55	4.00	4.80	0.80	100										
Norwich Office: 01603 613111 London Office: 020 7537 9233 Cambridge Office: 01223 781585 Testing Services: 01603 416333 E-mail: info@harrisingroupuk.com Website: www.harrisingroupuk.com					Remarks:									
					1. Inspection pit from GL to 1.20m.									
					2. SPT rod drilled from 4.80m to 5.75m to allow installation of 19mm standpipe. Two SPT tests detailed for the continuous depth drive.									
					3. Installation: 19mm standpipe GL to 1.00m plain, 1.00m to 5.70m slotted, fitted with cap and tophat cover.									
					4. Backfill: GL to 0.20m concrete, 0.20m to 1.00m bentonite pellets, 1.00m to 5.75m gravel.									
Drilled by: S. Bellchambers					Logged by: I. Reid			Checked by: M. Cooper			Fm-Hn-R-3068-Rev C			

					Dynamic Continuous Sampling Borehole Record					WS204		Sheet 2 of 2																																																																																																							
Project ID: GL22428A					Client: Trustees of the Langmead Pension Scheme					E: 497219.84		N: 103112.59																																																																																																							
Location: Land East of Drove Lane, Yapton					Consultant: Harrison Group Environmental Ltd					Date: 13/12/2018																																																																																																									
					Plant used: Premier Tracked 110 Rig					SPT Hammer Serial No: 382709 (ER: 88%)																																																																																																									
Geology Description Recovered as structureless CHALK composed of cream to white silty GRAVEL. Clasts are moderately weak, low density, white, angular to subangular fine to coarse chalk with frequent flint fragments. (Grade Dc) Drilled through by SPT rod only. No recovery					Legend	Depth (m)	Elevation (maOD) 5.67	Sample / In-Situ Test Information			Casing (Water)	Installation & Backfill																																																																																																							
								Type	Depth	Results / Remarks																																																																																																									
Borehole completed at 5.75m.						5.75	-0.08	SPT(C)	5.30	N=38 (12,11/10,9,9,10)	-																																																																																																								
<table border="1"> <thead> <tr> <th colspan="5">Window or Windowless Sampling Run Details</th> <th colspan="7">Water Strike</th> </tr> <tr> <th>Diameter (mm)</th> <th>Top Depth (m)</th> <th>Base Depth (m)</th> <th>Sample Length (m)</th> <th>Recovery (%)</th> <th>Date</th> <th>Strike Depth (m)</th> <th>Depth Sealed (m)</th> <th>Casing Depth (m)</th> <th>Time Elapsed (mins)</th> <th>Standing Level (m)</th> <th>Remarks</th> </tr> </thead> <tbody> <tr> <td>85</td> <td>1.20</td> <td>2.00</td> <td>0.80</td> <td>100</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>3.60</td> <td rowspan="4">No groundwater encountered</td> </tr> <tr> <td>75</td> <td>2.00</td> <td>3.00</td> <td>1.00</td> <td>100</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>65</td> <td>3.00</td> <td>4.00</td> <td>1.00</td> <td>100</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>55</td> <td>4.00</td> <td>4.80</td> <td>0.80</td> <td>100</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td colspan="5" rowspan="2"> Norwich Office: 01603 613111 London Office: 020 7537 9233 Cambridge Office: 01223 781585 Testing Services: 01603 416333 E-mail: info@harrisingroupuk.com Website: www.harrisingroupuk.com </td> <td colspan="7"> Remarks: 1. Inspection pit from GL to 1.20m. 2. SPT rod drilled from 4.80m to 5.75m to allow installation of 19mm standpipe. Two SPT tests detailed for the continuous depth drive. 3. Installation: 19mm standpipe GL to 1.00m plain, 1.00m to 5.70m slotted, fitted with cap and tophat cover. 4. Backfill: GL to 0.20m concrete, 0.20m to 1.00m bentonite pellets, 1.00m to 5.75m gravel. </td> </tr> <tr> <td colspan="7"></td> </tr> <tr> <td colspan="5">Drilled by: S. Bellchambers</td> <td colspan="4">Logged by: I. Reid</td> <td colspan="3">Checked by: M. Cooper</td> <td colspan="2">Fm-Hn-R-3068-Rev C</td> </tr> </tbody> </table>														Window or Windowless Sampling Run Details					Water Strike							Diameter (mm)	Top Depth (m)	Base Depth (m)	Sample Length (m)	Recovery (%)	Date	Strike Depth (m)	Depth Sealed (m)	Casing Depth (m)	Time Elapsed (mins)	Standing Level (m)	Remarks	85	1.20	2.00	0.80	100						3.60	No groundwater encountered	75	2.00	3.00	1.00	100							65	3.00	4.00	1.00	100							55	4.00	4.80	0.80	100							Norwich Office: 01603 613111 London Office: 020 7537 9233 Cambridge Office: 01223 781585 Testing Services: 01603 416333 E-mail: info@harrisingroupuk.com Website: www.harrisingroupuk.com					Remarks: 1. Inspection pit from GL to 1.20m. 2. SPT rod drilled from 4.80m to 5.75m to allow installation of 19mm standpipe. Two SPT tests detailed for the continuous depth drive. 3. Installation: 19mm standpipe GL to 1.00m plain, 1.00m to 5.70m slotted, fitted with cap and tophat cover. 4. Backfill: GL to 0.20m concrete, 0.20m to 1.00m bentonite pellets, 1.00m to 5.75m gravel.														Drilled by: S. Bellchambers					Logged by: I. Reid				Checked by: M. Cooper			Fm-Hn-R-3068-Rev C	
Window or Windowless Sampling Run Details					Water Strike																																																																																																														
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Norwich Office: 01603 613111 London Office: 020 7537 9233 Cambridge Office: 01223 781585 Testing Services: 01603 416333 E-mail: info@harrisingroupuk.com Website: www.harrisingroupuk.com					Remarks: 1. Inspection pit from GL to 1.20m. 2. SPT rod drilled from 4.80m to 5.75m to allow installation of 19mm standpipe. Two SPT tests detailed for the continuous depth drive. 3. Installation: 19mm standpipe GL to 1.00m plain, 1.00m to 5.70m slotted, fitted with cap and tophat cover. 4. Backfill: GL to 0.20m concrete, 0.20m to 1.00m bentonite pellets, 1.00m to 5.75m gravel.																																																																																																														
Drilled by: S. Bellchambers					Logged by: I. Reid				Checked by: M. Cooper			Fm-Hn-R-3068-Rev C																																																																																																							

					Dynamic Continuous Sampling Borehole Record					WS205		Sheet 1 of 2	
Project ID: GL22428A					Client: Trustees of the Langmead Pension Scheme					E: 497424.84		N: 103051.23	
Location: Land East of Drove Lane, Yapton					Consultant: Harrison Group Environmental Ltd					Date: 13/12/2018			
					Plant used: Premier Tracked 110 Rig					SPT Hammer Serial No: 382709 (ER: 88%)			
Geology Description					Legend	Depth (m)	Elevation (maOD) 6.68	Sample / In-Situ Test Information			Casing (Water)	Installation & Backfill	
								Type	Depth	Results / Remarks			
MADE GROUND. Very soft brown slightly gravelly slightly organic CLAY. Gravel is angular to subrounded fine and medium brick and flint. Very soft orangish brown slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse flint.						0.15	6.53	D1	0.10				
								B1	0.50				
								D2	0.50				
								SPT(C) D3	1.00				N=8 (1,1/2,2,3)
									1.00				
								D4	1.50				
									SPT(C) D5				2.00
								2.00					
								D6	2.50				
									SPT(C) D7				3.00
3.00													
D8	3.50												
	SPT(C) D9	4.00	N=22 (3,5/6,6,5,5)										
4.00													
D10	4.50												
	SPT(C) D11	4.80	N=30 (7,7/8,7,7,8)										
4.80													
Recovered as structureless CHALK composed of cream to white silty GRAVEL. Clasts are moderately weak, low density, white, angular to subangular fine to coarse chalk with frequent flint						4.65	2.03						
						4.80	1.88						
Window or Windowless Sampling Run Details					Water Strike								
Diameter (mm)	Top Depth (m)	Base Depth (m)	Sample Length (m)	Recovery (%)	Date	Strike Depth (m)	Depth Sealed (m)	Casing Depth (m)	Time Elapsed (mins)	Standing Level (m)	Remarks		
					13-12-2018	3.60			20	3.60			
85	1.20	2.00	0.80	100	Remarks: 1. Inspection pit from GL to 1.20m. 2. SPT rod drilled from 4.80m to 5.75m to allow installation of 19mm standpipe. Two SPT tests detailed for the continuous depth drive. 3. Installation: 19mm standpipe GL to 1.50m plain, 1.50m to 5.70m slotted, fitted with cap and tophat cover. 4. Backfill: GL to 0.20m concrete, 0.20m to 1.50m bentonite pellets, 1.50m to 5.75m gravel.								
75	2.00	3.00	1.00	100									
65	3.00	4.00	1.00	100									
55	4.00	4.80	0.80	100									
Norwich Office: 01603 613111 London Office: 020 7537 9233 Cambridge Office: 01223 781585 Testing Services: 01603 416333 E-mail: info@harrisingroupuk.com Website: www.harrisingroupuk.com													
Drilled by: S. Bellchambers					Logged by: I. Reid			Checked by: M. Cooper			Fm-Hn-R-3068-Rev C		



Dynamic Continuous

Sampling Borehole Record

WS206

Sheet 1 of 1

Project ID: GL22428A

Client: Trustees of the Langmead Pension Scheme

E: 497324.61 N: 103138.85

Location: Land East of Drove Lane, Yapton

Consultant: Harrison Group Environmental Ltd

Date: 12/12/2018

Plant used: Premier Tracked 110 Rig

SPT Hammer Serial No: 382709 (ER: 88%)

Geology Description	Legend	Depth (m)	Elevation (maOD) 5.90	Sample / In-Situ Test Information			Casing (Water)	Installation & Backfill
				Type	Depth	Results / Remarks		
MADE GROUND. Very soft brown slightly gravelly slightly organic clayey SILT. Gravel is subangular to subrounded fine brick and flint. Very soft brown to orangish brown slightly sandy CLAY with rare gravel of subrounded fine flint.		0.20	5.70	D1	0.10	N=5 (1,1/1,1,1,2)	-	
				B1	0.50			
				D2	0.50			
				SPT(C) D3	1.00 1.00			
				D4	1.50			
Brown locally mottled light grey gravelly SILT. Gravel is subangular to subrounded fine to coarse flint.		2.80	3.10	SPT(C) D5	2.00 2.00	N=3 (0,0/0,1,1,1)	-	
				D6	2.50			
Recovered as structureless CHALK composed of cream to white gravelly SILT. Gravel is weak, low density, cream to white, angular to subrounded fine to coarse chalk with flint fragments. (Grade Dm)		3.30	2.60	D7	3.00 3.00	N=0 (0,0/0,0,0,0)	-	
				D8	3.50			
Drilled through by SPT rod only. No recovery		4.00	1.90	D9	4.00			
Borehole completed at 5.00m.		5.00	0.90					

Window or Windowless Sampling Run Details					Water Strike							
Diameter (mm)	Top Depth (m)	Base Depth (m)	Sample Length (m)	Recovery (%)	Date	Strike Depth (m)	Depth Sealed (m)	Casing Depth (m)	Time Elapsed (mins)	Standing Level (m)	Remarks	
85	1.20	2.00	0.80	100	12-12-2018	3.20			20	2.40		
75	2.00	3.00	1.00	100								
65	3.00	4.00	1.00	100								
					Remarks: 1. Inspection pit from GL to 1.20m. 2. SPT rod continuously drilled from 4.00m to 5.00m to allow installation of 19mm standpipe. 3. Installation: 19mm standpipe GL to 1.00m plain, 1.00m to 5.00m slotted, fitted with cap and tophat cover. 4. Backfill: GL to 0.20m concrete, 0.20m to 1.00m bentonite pellets, 1.00m to 5.00m gravel.							
Norwich Office: 01603 613111 London Office: 020 7537 9233 Cambridge Office: 01223 781585 Testing Services: 01603 416333 E-mail: info@harrisingroupuk.com Website: www.harrisingroupuk.com												
Drilled by: S. Bellchambers					Logged by: I. Reid			Checked by: M. Cooper			Fm-Hn-R-3068-Rev C	

ARUN DISTRICT COUNCIL Y/153/21/DOC

Dynamic Continuous Sampling Borehole Record

WS207

Sheet 1 of 1

Project ID: GL22428A

Location: Land East of Drove Lane, Yapton

Client: Trustees of the Langmead Pension Scheme

Consultant: Harrison Group Environmental Ltd

Plant used: Premier Tracked 110 Rig

E: 497457.58 N: 103110.55

Date: 13/12/2018

SPT Hammer Serial No: 382709 (ER: 88%)

Geology Description	Legend	Depth (m)	Elevation (maOD) 6.44	Sample / In-Situ Test Information			Casing (Water)	Installation & Backfill	
				Type	Depth	Results / Remarks			
MADE GROUND. Very soft brown slightly gravelly slightly organic CLAY. Gravel is angular to subrounded fine and coarse brick and flint. Soft orangish brown slightly sandy CLAY with rare gravel of subangular to subrounded fine to coarse flint.		0.25	6.19	D1	0.10				
				B1	0.50				
				D2	0.50				
				SPT(C) D3	1.00 1.00				N=5 (1,1/1,1,2,1)
				D4	1.50				
Brown locally mottled light grey gravelly SILT. Gravel is subangular to subrounded fine to coarse flint. From 2.80m: Chalk present in gravel.		2.40	4.04	D6	2.50				
				SPT(C) D7	3.00 3.00				N=6 (0,1/1,1,3,1)
Recovered as structureless CHALK composed of cream to white gravelly SILT. Gravel is weak to moderately weak, low density, white, angular to subrounded fine to coarse chalk with flint fragments. (Grade Dm)		3.10	3.34	D8	3.50				
				SPT(C) D9	4.00 4.00				N=16 (3,3/3,4,5,4)
Drilled through by SPT rod only. No recovery		4.00	2.44	SPT(C) D10	4.50 4.50	N=10 (4,4/3,3,2,2)			
				D11	4.80				
Borehole completed at 5.00m.		5.00	1.44						

Window or Windowless Sampling Run Details

Diameter (mm)	Top Depth (m)	Base Depth (m)	Sample Length (m)	Recovery (%)
85	1.20	2.00	0.80	100
75	2.00	3.00	1.00	100
65	3.00	4.00	1.00	100

Water Strike

Date	Strike Depth (m)	Depth Sealed (m)	Casing Depth (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
13-12-2018	3.20			20	2.90	

Remarks:

- Inspection pit from GL to 1.20m.
- SPT rod drilled from 4.00m to 5.00m to allow installation of 19mm standpipe. Two SPT tests detailed for the continuous depth drive.
- Installation: 19mm standpipe GL to 1.00m plain, 1.00m to 5.00m slotted, fitted with cap and tophat cover.
- Backfill: GL to 0.20m concrete, 0.20m to 1.00m bentonite pellets, 1.00m to 5.00m gravel.

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London Office: 020 7537 9233
Cambridge Office: 01223 781585
Testing Services: 01603 416333

E-mail: info@harrisingroupuk.com
Website: www.harrisingroupuk.com

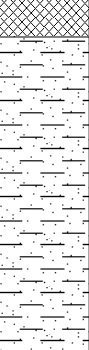
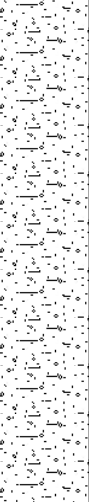
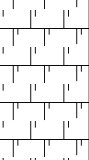
Drilled by: S. Bellchambers

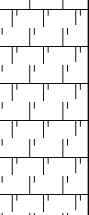
Logged by: I. Reid

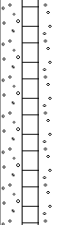
Checked by: M. Cooper

Fm-Hn-R-3068-Rev C

ARUN DISTRICT COUNCIL Y/153/21/DOC

					Dynamic Continuous Sampling Borehole Record					WS208		Sheet 1 of 2	
Project ID: GL22428A					Client: Trustees of the Langmead Pension Scheme					E: 497398.15		N: 103175.52	
Location: Land East of Drove Lane, Yapton					Consultant: Harrison Group Environmental Ltd					Date: 12/12/2018			
					Plant used: Premier Tracked 110 Rig					SPT Hammer Serial No: 382709 (ER: 88%)			
Geology Description					Legend	Depth (m)	Elevation (maOD) 6.06	Sample / In-Situ Test Information			Casing (Water)	Installation & Backfill	
								Type	Depth	Results / Remarks			
MADE GROUND. Very soft brown slightly gravelly slightly organic CLAY. Gravel is angular to subrounded fine and medium brick and flint. Very soft orangish brown slightly sandy CLAY.						0.15	5.91	D1	0.10				
								B1 D2	0.50 0.50				
								SPT(C) D3	1.00 1.00				N=10 (1,1/2,2,3,3)
Loose becoming medium dense brown to orangish brown slightly gravelly slightly clayey fine SAND. Gravel is angular to subrounded fine to coarse flint.						1.40	4.66	D4	1.50				
								SPT(C) D5	2.00 2.00				N=7 (1,1/1,1,2,3)
								D6	2.50				
								SPT(C) D7	3.00 3.00				N=16 (3,3/3,4,4,5)
Light brown mottled light grey gravelly SILT. Gravel is subangular to subrounded fine and medium flint and chalk.						3.40	2.66	D8	3.50				
								SPT(C) D9	4.00 4.00				N=36 (2,2/3,8,12,13)
Recovered as structureless CHALK composed of cream to white gravelly SILT. Gravel is weak, low density, cream to white, angular to subangular fine to coarse chalk with flint fragments. (Grade Dm)						4.35	1.71	D10 SPT(C)	4.50 4.60	N=40 (8,10/10,9,9,12)			
Window or Windowless Sampling Run Details					Water Strike								
Diameter (mm)	Top Depth (m)	Base Depth (m)	Sample Length (m)	Recovery (%)	Date	Strike Depth (m)	Depth Sealed (m)	Casing Depth (m)	Time Elapsed (mins)	Standing Level (m)	Remarks		
85	1.20	2.00	0.80	100	12-12-2018	3.90			20	3.80			
75	2.00	3.00	1.00	100	Remarks: 1. Inspection pit from GL to 1.20m. 2. Hole collapsed from 5.05m to 4.40m following SPT test. 3. Installation: 50mm standpipe GL to 1.00m plain, 1.00m to 4.40m slotted, fitted with gas tap, bung and tophat cover. 4. Backfill: GL to 0.20m concrete, 0.20m to 1.00m bentonite pellets, 1.00m to 4.40m gravel, 4.40m to 5.05m arisings.								
65	3.00	4.00	1.00	100									
55	4.00	5.00	1.00	100									
Norwich Office: 01603 613111 London Office: 020 7537 9233 Cambridge Office: 01223 781585 Testing Services: 01603 416333 E-mail: info@harrisingroupuk.com Website: www.harrisingroupuk.com													
Drilled by: S. Bellchambers					Logged by: I. Reid			Checked by: M. Cooper			Fm-Hn-R-3068-Rev C		

					Dynamic Continuous Sampling Borehole Record					WS209		Sheet 1 of 2	
Project ID: GL22428A					Client: Trustees of the Langmead Pension Scheme					E: 497294.83		N: 103247.25	
Location: Land East of Drove Lane, Yapton					Consultant: Harrison Group Environmental Ltd					Date: 14/12/2018			
					Plant used: Premier Tracked 110 Rig					SPT Hammer Serial No: 382709 (ER: 88%)			
Geology Description					Legend	Depth (m)	Elevation (maOD) 5.66	Sample / In-Situ Test Information			Casing (Water)	Installation & Backfill	
								Type	Depth	Results / Remarks			
MADE GROUND. Very soft brown slightly gravelly slightly organic CLAY. Gravel is angular to subrounded fine to coarse brick and flint.						0.20	5.46	D1	0.10				
Soft orangish brown slightly gravelly CLAY. Gravel is subangular to subrounded fine and medium flint.													
<i>From 1.45m to 1.64m: Band of dark orangish brown slightly clayey gravelly fine and medium sand. Gravel is subangular to subrounded fine flint.</i>								B1	0.50				
								D2	0.50				
								SPT(C) D3	1.00 1.00				N=6 (1,1/1,1,2,2)
								D4	1.50				
								SPT(C) D5	2.00 2.00				N=6 (0,0/0,1,3,2)
								D6	2.50				
Light grey mottled light brown very gravelly SILT. Gravel is angular to subrounded fine to coarse chalk and flint.						2.80	2.86	SPT(C) D7	3.00 3.00				
								D8	3.50				
								SPT(C) D9	4.00 4.00				N=3 (0,0/0,1,1,1)
								D10	4.50				
Recovered as structureless CHALK composed of cream to off-white gravelly SILT. Gravel is weak to moderately weak, low density, off-white, subangular to subrounded fine to coarse chalk with flint fragments. (Grade Dm)									4.10				1.56
							N=20 (2,5/4,5,6,5)						
Window or Windowless Sampling Run Details					Water Strike								
Diameter (mm)	Top Depth (m)	Base Depth (m)	Sample Length (m)	Recovery (%)	Date	Strike Depth (m)	Depth Sealed (m)	Casing Depth (m)	Time Elapsed (mins)	Standing Level (m)	Remarks		
85	1.20	2.00	0.80	100	14-12-2018	4.10			20	4.10			
75	2.00	3.00	1.00	100	Remarks: 1. Inspection pit from GL to 1.20m. 2. SPT rod drilled from 5.00m to 5.90m to allow installation of 19mm standpipe. Two SPT tests detailed for the continuous depth drive. 3. Installation: 19mm standpipe GL to 1.00m plain, 1.00m to 5.90m slotted, fitted with cap and tophat cover. 4. Backfill: GL to 0.20m concrete, 0.20m to 1.00m bentonite pellets, 1.00m to 5.90m gravel.								
65	3.00	4.00	1.00	100									
55	4.00	5.00	1.00	100									
Norwich Office: 01603 613111 London Office: 020 7537 9233 Cambridge Office: 01223 781585 Testing Services: 01603 416333 E-mail: info@harrisingroupuk.com Website: www.harrisingroupuk.com													
Drilled by: S. Bellchambers					Logged by: I. Reid			Checked by: M. Cooper			Fm-Hn-R-3068-Rev C		

					Dynamic Continuous Sampling Borehole Record					WS209		Sheet 2 of 2																																							
Project ID: GL22428A					Client: Trustees of the Langmead Pension Scheme					E: 497294.83		N: 103247.25																																							
Location: Land East of Drove Lane, Yapton					Consultant: Harrison Group Environmental Ltd					Date: 14/12/2018																																									
					Plant used: Premier Tracked 110 Rig					SPT Hammer Serial No: 382709 (ER: 88%)																																									
Geology Description					Legend	Depth (m)	Elevation (maOD) 5.66	Sample / In-Situ Test Information			Casing (Water)	Installation & Backfill																																							
								Type	Depth	Results / Remarks																																									
Drilled through by SPT rod only. No recovery						5.90	-0.24	SPT(C)	5.45	N=20 (4,4/4,6,6,4)	-																																								
Borehole completed at 5.90m.																																																			
Window or Windowless Sampling Run Details <table border="1"> <thead> <tr> <th>Diameter (mm)</th> <th>Top Depth (m)</th> <th>Base Depth (m)</th> <th>Sample Length (m)</th> <th>Recovery (%)</th> </tr> </thead> <tbody> <tr><td>85</td><td>1.20</td><td>2.00</td><td>0.80</td><td>100</td></tr> <tr><td>75</td><td>2.00</td><td>3.00</td><td>1.00</td><td>100</td></tr> <tr><td>65</td><td>3.00</td><td>4.00</td><td>1.00</td><td>100</td></tr> <tr><td>55</td><td>4.00</td><td>5.00</td><td>1.00</td><td>100</td></tr> </tbody> </table> Water Strike <table border="1"> <thead> <tr> <th>Date</th> <th>Strike Depth (m)</th> <th>Depth Sealed (m)</th> <th>Casing Depth (m)</th> <th>Time Elapsed (mins)</th> <th>Standing Level (m)</th> <th>Remarks</th> </tr> </thead> <tbody> <tr> <td>14-12-2018</td> <td>4.10</td> <td></td> <td></td> <td>20</td> <td>4.10</td> <td></td> </tr> </tbody> </table> Remarks: 1. Inspection pit from GL to 1.20m. 2. SPT rod drilled from 5.00m to 5.90m to allow installation of 19mm standpipe. Two SPT tests detailed for the continuous depth drive. 3. Installation: 19mm standpipe GL to 1.00m plain, 1.00m to 5.90m slotted, fitted with cap and tophat cover. 4. Backfill: GL to 0.20m concrete, 0.20m to 1.00m bentonite pellets, 1.00m to 5.90m gravel.													Diameter (mm)	Top Depth (m)	Base Depth (m)	Sample Length (m)	Recovery (%)	85	1.20	2.00	0.80	100	75	2.00	3.00	1.00	100	65	3.00	4.00	1.00	100	55	4.00	5.00	1.00	100	Date	Strike Depth (m)	Depth Sealed (m)	Casing Depth (m)	Time Elapsed (mins)	Standing Level (m)	Remarks	14-12-2018	4.10			20	4.10	
Diameter (mm)	Top Depth (m)	Base Depth (m)	Sample Length (m)	Recovery (%)																																															
85	1.20	2.00	0.80	100																																															
75	2.00	3.00	1.00	100																																															
65	3.00	4.00	1.00	100																																															
55	4.00	5.00	1.00	100																																															
Date	Strike Depth (m)	Depth Sealed (m)	Casing Depth (m)	Time Elapsed (mins)	Standing Level (m)	Remarks																																													
14-12-2018	4.10			20	4.10																																														
Norwich Office: 01603 613111 London Office: 020 7537 9233 Cambridge Office: 01223 781585 Testing Services: 01603 416333 E-mail: info@harrisingroupuk.com Website: www.harrisingroupuk.com					Logged by: I. Reid			Checked by: M. Cooper			Fm-Hn-R-3068-Rev C																																								

Dynamic Continuous Sampling Borehole Record

WS210

Sheet 1 of 2

Project ID: GL22428A

Location: Land East of Drove Lane, Yapton

Client: Trustees of the Langmead Pension Scheme

Consultant: Harrison Group Environmental Ltd

Plant used: Premier Tracked 110 Rig

E: 497374.11 N: 103349.24

Date: 12/12/2018

SPT Hammer Serial No: 382709 (ER: 88%)

Geology Description	Legend	Depth (m)	Elevation (maOD) 6.04	Sample / In-Situ Test Information			Casing (Water)	Installation & Backfill
				Type	Depth	Results / Remarks		
MADE GROUND. Soft brown slightly gravelly slightly organic CLAY. Gravel is subangular to subrounded fine brick and flint.		0.25	5.79	D1	0.20	N=5 (1,1/1,1,2,1)	-	
Very soft orangish brown slightly sandy CLAY with rare gravel of subrounded fine to coarse flint.	B1			0.50				
	D2			0.50				
	SPT(C) D3			1.00 1.00				
	D4			1.50				
Loose orangish brown mottled white gravelly fine to coarse SAND. Gravel is angular to subrounded fine and medium flint and chalk. Locally a slightly sandy slightly gravelly clay.	SPT(C) D5	2.00 2.00	N=4 (0,0/1,1,1,1)	-				
	D6	2.50						
	SPT(C) D7	3.00 3.00			N=8 (1,1/2,2,2,2)	-		
	D8	3.50						
Recovered as structureless CHALK composed of cream to white gravelly SILT. Gravel is weak, medium density, cream to white, angular to subangular fine to coarse chalk with flint fragments. (Grade Dm)	SPT(C) D9	4.00 4.00	N=6 (0,0/1,2,1,2)	-				
	D10	4.50						
		SPT(S) D11	5.00 5.00	N=26 (4,4/5,6,7,8)	-			
		D12	5.00 - 5.45					

Window or Windowless Sampling Run Details

Diameter (mm)	Top Depth (m)	Base Depth (m)	Sample Length (m)	Recovery (%)
85	1.20	2.00	0.80	100
75	2.00	3.00	1.00	100
65	3.00	4.00	1.00	100
55	4.00	5.00	1.00	100

Water Strike

Date	Strike Depth (m)	Depth Sealed (m)	Casing Depth (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
12-12-2018	3.60			20	3.50	

Remarks:

1. Inspection pit from GL to 1.20m.
2. Installation: 50mm standpipe GL to 1.00m plain, 1.00m to 5.00m slotted, fitted with gas tap, bung and tophat cover.
3. Backfill: GL to 0.20m concrete, 0.20m to 1.00m bentonite pellets, 1.00m to 5.45m gravel.

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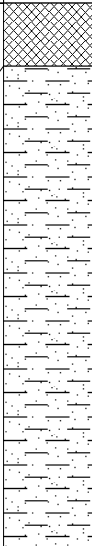
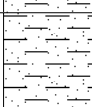
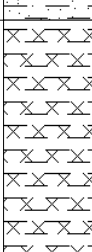
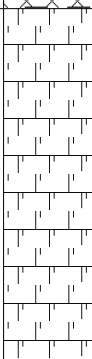
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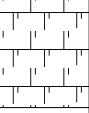
Drilled by: S. Bellchambers

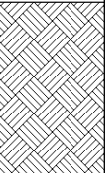
Logged by: I. Reid

Checked by: M. Cooper

Fm-Hn-R-3068-Rev C

					Dynamic Continuous Sampling Borehole Record					WS211		Sheet 1 of 2									
Project ID: GL22428A					Client: Trustees of the Langmead Pension Scheme					E: 497490.76 N: 103232.89											
Location: Land East of Drove Lane, Yapton					Consultant: Harrison Group Environmental Ltd					Date: 12/12/2018											
					Plant used: Premier Tracked 110 Rig					SPT Hammer Serial No: 382709 (ER: 88%)											
Geology Description					Legend	Depth (m)	Elevation (maOD) 6.35	Sample / In-Situ Test Information			Casing (Water)	Installation & Backfill									
								Type	Depth	Results / Remarks											
MADE GROUND. Very soft brown slightly gravelly slightly organic CLAY. Gravel is angular to subrounded fine and medium brick and flint. Very soft brown slightly sandy CLAY with rare gravel of angular to subangular flint.						0.25	6.10	B1	0.20												
								D1	0.20												
								D2	0.50												
								SPT(C) D3	1.00 1.00				N=6 (1,1/1,1,2,2)								
Soft orangish brown slightly sandy CLAY.						2.20	4.15	D4	1.50												
								SPT(C) D5	2.00 2.00				N=3 (1,0/1,0,1,1)								
Orangish brown slightly sandy gravelly CLAY. Gravel is angular to subrounded medium and coarse flint.						2.65	3.70	D6	2.50												
								SPT(C) D7	3.00 3.00				N=11 (2,2/2,3,3,3)								
								D8	3.50												
								SPT(C) D9	4.00 4.00							N=4 (1,1/1,1,1,1)					
Recovered as structureless CHALK composed of cream to white gravelly SILT. Gravel is weak, low density, cream to white, angular to subangular fine to coarse chalk with flint fragments. (Grade Dm)						3.60	2.75	D10	4.50												
								SPT(S) D11 D12	5.00 5.00 5.00 - 5.45				N=26 (2,3/4,7,7,8)								
Window or Windowless Sampling Run Details					Water Strike																
Diameter (mm)	Top Depth (m)	Base Depth (m)	Sample Length (m)	Recovery (%)	Date	Strike Depth (m)	Depth Sealed (m)	Casing Depth (m)	Time Elapsed (mins)	Standing Level (m)	Remarks										
85	1.20	2.00	0.80	100	12-12-2018	4.50			20	3.30											
75	2.00	3.00	1.00	100	Remarks: 1. Inspection pit from GL to 1.20m. 2. Installation: 50mm standpipe GL to 1.00m plain, 1.00m to 5.00m slotted, fitted with gas tap, bung and tophat cover. 3. Backfill: GL to 0.20m concrete, 0.20m to 1.00m bentonite pellets, 1.00m to 5.45m gravel.																
65	3.00	4.00	1.00	100																	
55	4.00	5.00	1.00	100																	
Norwich Office: 01603 613111 London Office: 020 7537 9233 Cambridge Office: 01223 781585 Testing Services: 01603 416333 E-mail: info@harrisingroupuk.com Website: www.harrisingroupuk.com																					
Drilled by: S. Bellchambers					Logged by: I. Reid			Checked by: M. Cooper			Fm-Hn-R-3068-Rev										

					Dynamic Continuous Sampling Borehole Record					WS211		Sheet 2 of 2	
Project ID: GL22428A					Client: Trustees of the Langmead Pension Scheme					E: 497490.76		N: 103232.89	
Location: Land East of Drove Lane, Yapton					Consultant: Harrison Group Environmental Ltd					Date: 12/12/2018			
					Plant used: Premier Tracked 110 Rig					SPT Hammer Serial No: 382709 (ER: 88%)			
Geology Description					Legend	Depth (m)	Elevation (maOD) 6.35	Sample / In-Situ Test Information			Casing (Water)	Installation & Backfill	
								Type	Depth	Results / Remarks			
Recovered as structureless CHALK composed of cream to white gravelly SILT. Gravel is weak, low density, cream to white, angular to subangular fine to coarse chalk with flint fragments. (Grade Dm)						5.45	0.90						
Borehole completed at 5.45m.													
Window or Windowless Sampling Run Details					Water Strike								
Diameter (mm)	Top Depth (m)	Base Depth (m)	Sample Length (m)	Recovery (%)	Date	Strike Depth (m)	Depth Sealed (m)	Casing Depth (m)	Time Elapsed (mins)	Standing Level (m)	Remarks		
85	1.20	2.00	0.80	100	12-12-2018	4.50			20	3.30			
75	2.00	3.00	1.00	100	Remarks: 1. Inspection pit from GL to 1.20m. 2. Installation: 50mm standpipe GL to 1.00m plain, 1.00m to 5.00m slotted, fitted with gas tap, bung and tophat cover. 3. Backfill: GL to 0.20m concrete, 0.20m to 1.00m bentonite pellets, 1.00m to 5.45m gravel.								
65	3.00	4.00	1.00	100									
55	4.00	5.00	1.00	100									
Norwich Office: 01603 613111 London Office: 020 7537 9233 Cambridge Office: 01223 781585 Testing Services: 01603 416333 E-mail: info@harrisingroupuk.com Website: www.harrisingroupuk.com													
Drilled by: S. Bellchambers					Logged by: I. Reid				Checked by: M. Cooper			Fm-Hn-R-3068-Rev C	

		Trial Pit Record			PO201		Sheet 1 of 1	
Project ID: GL22428A		Client: Trustees of the Langmead Pension Scheme			E: 497267.88 N: 102941.97			
Location: Drove Lane, Yapton		Consultant: Campbell Reith Hill LLP						
		Plant used: Hand Excavated			Date: 25/03/2019			
Geology Description		Legend	Depth	Elevation (maOD)	Sample / In-Situ Test Information			Installation & Backfill
				6.06	Type	Depth	Results / Remarks	
TOPSOIL. Soft light brown CLAY. Locally slightly gravelly. Gravel is angular to subrounded fine to coarse flint. Occasional rootlets present.					B1 D1	0.15 0.15		
Very soft orangish brown slightly sandy CLAY. Locally slightly gravelly. Gravel is angular to subrounded fine to coarse flint. Rare rootlets present.			0.25	5.81				
Trial pit terminated at 0.50m.			0.50	5.56				
PRELIMINARY								
Weather: Sunny and dry		Water Strike						
Pit Stability: Stable		Date	Water Strike (m)	Time Elapsed (mins)	Standing Level (m)	Remarks		
Shoring Used:						No groundwater encountered		
Pit Dimensions: L: 0.30m x W: 0.30m		Remarks						
Norwich Office: 01603 613111 London Office: 020 7537 9233 Cambridge Office: 01223 781585 Colchester Office: 01206 986675 Testing Services: 01603 416333 E-mail: info@harrisingroupuk.com Website: www.harrisingroupuk.com		 1. Backfill: GL to 0.50m arisings.						
Logged by: J. Sparks				Checked by: M. Cooper		Fm-Hn-R-3069-Rev E		

Project ID:	GL22428A	Client:	Trustees of the Langmead Pension Scheme	E:	497284.68	N:	103044.20
Location:	Drove Lane, Yapton	Consultant:	Campbell Reith Hill LLP				
		Plant used:	Hand Excavated	Date:	25/03/2019		

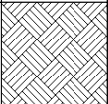
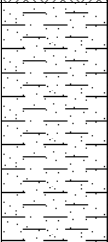
Geology Description	Legend	Depth	Elevation (maOD)	Sample / In-Situ Test Information			Installation & Backfill
			6.22	Type	Depth	Results / Remarks	
TOPSOIL. Soft light brown CLAY. Occasional rootlets present.							
Soft orangish brown slightly sandy CLAY. Locally slightly gravelly. Gravel is angular to subrounded fine to coarse flint. Rare rootlets present.		0.20	6.02	B1 D1	0.30		
					0.30		
Trial pit terminated at 0.50m.		0.50	5.72				

Weather: Sunny and dry		Water Strike				
Pit Stability: Stable		Date	Water Strike (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
Shoring Used:						No groundwater encountered
Pit Dimensions: L: 0.30m x W: 0.30m		Remarks 1. Backfill: GL to 0.50m arisings.				
Norwich Office: 01603 613111 London Office: 020 7537 9233 Cambridge Office: 01223 781585 Colchester Office: 01206 986675 Testing Services: 01603 416333 E-mail: info@harrisingroupuk.com Website: www.harrisingroupuk.com						
		Logged by: J. Sparks			Checked by: M. Cooper	
		Fm-Hn-R-3069-Rev E				

Date: 25/03/2019

Pit Dimensions: L: 0.30m x W: 0.30m		Remarks	
Norwich Office: 01603 613111 London Office: 020 7537 9233 Cambridge Office: 01223 781585 Colchester Office: 01206 986675 Testing Services: 01603 416333 E-mail: info@harrisingroupuk.com Website: www.harrisingroupuk.com		1. Backfill: GL to 0.50m arisings.	
Logged by: J. Sparks		Checked by: M. Cooper	Fm-Hn-R-3069-Rev E

Project ID:	GL22428A	Client:	Trustees of the Langmead Pension Scheme	E:	497401.65	N:	103171.13
Location:	Drove Lane, Yapton	Consultant:	Campbell Reith Hill LLP				
		Plant used:	Hand Excavated	Date:	25/03/2019		

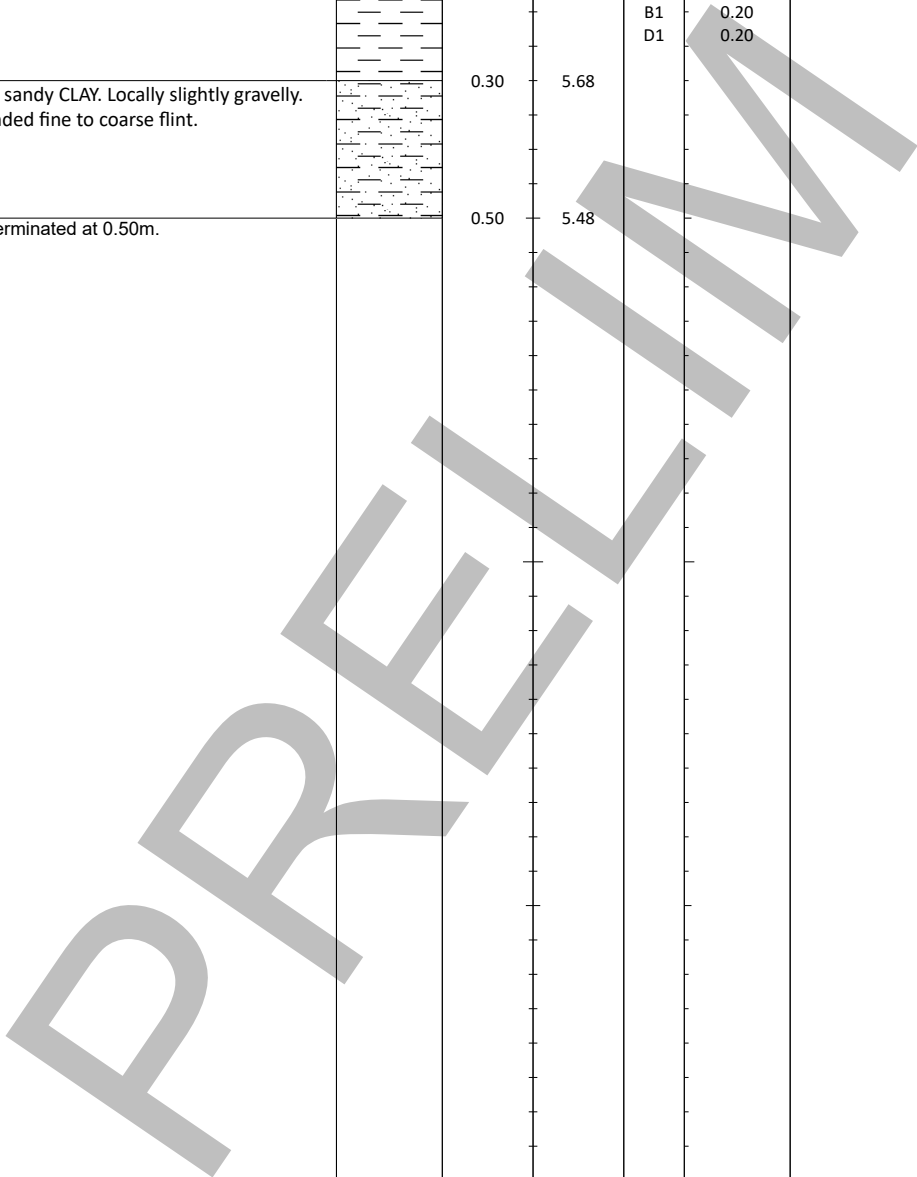
Geology Description	Legend	Depth	Elevation (maOD)	Sample / In-Situ Test Information			Installation & Backfill
			6.11	Type	Depth	Results / Remarks	
TOPSOIL. Soft light brown CLAY. Locally slightly gravelly. Gravel is angular to subrounded fine to coarse flint. Occasional rootlets present.							
Soft orangish brown slightly sandy CLAY. Locally slightly gravelly. Gravel is angular to subrounded fine to coarse flint.		0.15	5.96				
				B1 D1	0.30 0.30		
Trial pit terminated at 0.50m.		0.50	5.61				

Weather: Sunny and dry		Water Strike				
Pit Stability: Stable		Date	Water Strike (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
Shoring Used:						No groundwater encountered
Pit Dimensions: L: 0.30m x W: 0.30m		Remarks 1. Backfill: GL to 0.50m arisings.				
Norwich Office: 01603 613111 London Office: 020 7537 9233 Cambridge Office: 01223 781585 Colchester Office: 01206 986675 Testing Services: 01603 416333 E-mail: info@harrisingroupuk.com Website: www.harrisingroupuk.com						
		Logged by: J. Sparks		Checked by: M. Cooper		Fm-Hn-R-3069-Rev E

Project ID:	GL22428A	Client:	Trustees of the Langmead Pension Scheme	E:	497296.02	N:	103242.85
Location:	Drove Lane, Yapton	Consultant:	Campbell Reith Hill LLP				
		Plant used:	Hand Excavated	Date:	25/03/2019		

Geology Description	Legend	Depth	Elevation (maOD)	Sample / In-Situ Test Information			Installation & Backfill
			5.65	Type	Depth	Results / Remarks	
TOPSOIL. Soft light brown CLAY. Locally slightly gravelly. Gravel is angular to subrounded fine to coarse flint. Occasional rootlets present.							
Soft orangish brown slightly sandy CLAY. Locally slightly gravelly. Gravel is angular to subrounded fine to coarse flint.		0.20	5.45	B1 D1	0.30 0.30		
Trial pit terminated at 0.50m.		0.50	5.15				

Weather: Sunny and dry		Water Strike				
Pit Stability: Stable		Date	Water Strike (m)	Time Elapsed (mins)	Standing Level (m)	Remarks
Shoring Used:						No groundwater encountered
Pit Dimensions: L: 0.30m x W: 0.30m		Remarks 1. Backfill: GL to 0.50m arisings.				
Norwich Office: 01603 613111 London Office: 020 7537 9233 Cambridge Office: 01223 781585 Colchester Office: 01206 986675 Testing Services: 01603 416333 E-mail: info@harrisingroupuk.com Website: www.harrisingroupuk.com						
		Logged by: J. Sparks			Checked by: M. Cooper	
		Fm-Hn-R-3069-Rev E				

		Trial Pit Record			PO206		Sheet 1 of 1	
Project ID: GL22428A		Client: Trustees of the Langmead Pension Scheme			E: 497375.25 N: 103339.92			
Location: Drove Lane, Yapton		Consultant: Campbell Reith Hill LLP						
		Plant used: Hand Excavated			Date: 25/03/2019			
Geology Description		Legend	Depth	Elevation (maOD)	Sample / In-Situ Test Information			Installation & Backfill
				5.98	Type	Depth	Results / Remarks	
Very soft to soft brown CLAY. Locally slightly gravelly. Gravel is subangular to subrounded fine to coarse chalk. Occasional rootlets present.					B1 D1	0.20		
Soft orangish brown slightly sandy CLAY. Locally slightly gravelly. Gravel is angular to subrounded fine to coarse flint.			0.30	5.68		0.20		
Trial pit terminated at 0.50m.			0.50	5.48				
								
Weather: Sunny and dry		Water Strike						
Pit Stability: Stable		Date	Water Strike (m)	Time Elapsed (mins)	Standing Level (m)	Remarks		
Shoring Used:						No groundwater encountered		
Pit Dimensions: L: 0.30m x W: 0.30m		Remarks						
Norwich Office: 01603 613111 London Office: 020 7537 9233 Cambridge Office: 01223 781585 Colchester Office: 01206 986675 Testing Services: 01603 416333 E-mail: info@harrisingroupuk.com Website: www.harrisingroupuk.com		 1. Backfill: GL to 0.50m arisings.						
Logged by: J. Sparks				Checked by: M. Cooper			Fm-Hn-R-3069-Rev E	

APPENDIX C

GAS & GROUNDWATER MONITORING RECORDS

				Gas and PID Monitoring Results																	
Project ID: GL22428A				Client: Trustees of the Langmead Pension Scheme					Equipment Model / Serial Number					Manufacturer's Calibration Date							
Date: 21/12/2018 - 08/01/2019				Location: Land East of Drove Lane, Yapton					Gas Analyser: GA5000 / 501752					22/05/2019							
Weather conditions: Clear, Overcast									PID: Tiger Handheld VOC Detector / L-112924					11/10/2019							
Pump Running Time (Purge): Standard 30 secs. Pump Running Time (Sampling): Standard 180 secs. Flow Details: 5 sec average for 1 min.									PID Details: "<" indicates reading is under the detection limit. ">" indicates reading is over the upper limit. "***" level to be determined.												
Field engineer(s): S. Hedges/ I. Reid				Remarks:																	
Location ID	Monitoring Pipe and Diameter	Date Monitored	Time	Air Temp (°C)	Atmospheric Pressure 48Hrs Prior to Sampling (mB)	Atmospheric Pressure 24Hrs Prior to Sampling (mB)	Atmospheric Pressure 3Hrs Prior to Sampling (mB)	Atmospheric Pressure When Sampled (mB)	Relative Pressure (mB)	Peak PID (ppm)	Stable PID (ppm)	Methane (%)	Peak Methane (%)	Methane LEL (%)	Carbon Dioxide (%)	Oxygen (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	Flow (l/hr)		
WS202	PIPE1 (50mm)	21/12/2018	11:00:00	9.0	1005	1008	998	999	26.9			0.2	0.2	1.0	0.0	21.4	10.0	0.0	6.3		
			11:00:15									0.2			0.5	19.9	10.0		6.3		
			11:00:30									0.1			0.5	18.5	10.0		5.5		
			11:00:45									0.2			0.5	18.4	10.0		5.5		
			11:01:00									0.2			0.5	18.4	10.0		5.4		
			11:01:30									0.2			0.5	18.4	10.0		5.4		
			11:02:00									0.1			0.5	18.4	10.0		5.4		
			11:03:00									0.1			0.5	18.4	10.0		5.4		
		08/01/2019	13:45:00	10.0	1033	1026	1010	1028	0.1			0.2	0.2	1.0	0.1	21.8	0.0	0.0	0.0		
			13:45:15									0.2			1.1	18.6	0.0	0.0	0.0		
			13:45:30									0.1			1.2	15.2	0.0	0.0	0.0		
			13:45:45									0.1			1.2	14.9	0.0	0.0	0.0		
			13:46:00									0.1			1.1	14.9	0.0	0.0	0.0		
			13:46:30									0.1			1.1	14.9	0.0	0.0	0.0		
			13:47:00									0.1			1.1	14.9	0.0	0.0	0.0		
			13:48:00									0.1			1.1	14.9	0.0	0.0	0.0		
WS208	PIPE1 (50mm)	21/12/2018	10:00:00	8.0	1005	1007	998	999	0.0	0.3	0.1	0.2	0.2	1.0	0.1	20.7	0.0	0.0	-0.1		
			10:00:15							0.4	0.1	0.2			0.1	21.0	0.0		-0.1		
			10:00:30							0.3	0.1	0.2			0.1	21.1	0.0		-0.1		
			10:00:45							0.2	0.1	0.2			0.1	21.2	0.0		-0.1		
			10:01:00							0.2	0.1	0.2			0.1	21.2	0.0		-0.1		
			10:01:30							0.1	0.1	0.2			0.1	21.2	0.0		-0.1		
			10:02:00							0.1	0.1	0.2			0.0	21.2	0.0		-0.1		
			10:03:00							0.1	0.1	0.2			0.0	21.2	0.0		-0.1		
		08/01/2019	14:30:00	10.0	1033	1025	1010	1027	0.0			0.2	0.2	1.0	0.0	22.1	0.0	0.0	0.0		
			14:30:15									0.2			1.1	20.1	0.0	0.0	0.0		
			14:30:30									0.2			1.1	17.6	0.0	0.0	0.0		
			14:30:45									0.2			1.1	17.4	0.0	0.0	0.0		
			14:31:00									0.2			1.1	17.4	0.0	0.0	0.0		
			14:31:30									0.2			1.1	17.3	0.0	0.0	0.0		
			14:32:00									0.2			1.1	17.2	0.0	0.0	0.0		
			14:33:00									0.2			1.1	17.2	0.0	0.0	0.0		
WS210	PIPE1 (50mm)	21/12/2018	09:30:00	8.0	1005	1007	998	999	-0.2	0.4	0.0	0.2	0.2	1.0	0.0	20.9	2.0	0.0	-0.1		
			09:30:15							0.3	0.0	0.2			0.5	20.0	3.0		-0.1		
			09:30:30							0.2	0.0	0.2			0.5	17.4	4.0		-0.1		
			09:30:45							0.0	0.0	0.2			0.5	17.3	4.0		-0.1		
			09:31:00							0.0	0.0	0.2			0.5	17.3	4.0		-0.1		
			09:31:30							0.0	0.0	0.2			0.4	17.7	4.0		-0.1		
			09:32:00							0.0	0.0	0.2			0.4	17.8	4.0		-0.1		
			09:33:00							0.0	0.0	0.2			0.4	17.8	4.0		-0.1		
		08/01/2019	12:00:00	9.0	1033	1026	1010	1026	0.0			0.2	0.2	1.0	0.0	21.1	0.0	0.0	0.0		
			12:00:15									0.2			1.3	18.3	0.0	0.0	0.0		
			12:00:30									0.2			1.3	12.2	0.0	0.0	0.0		
			12:00:45									0.2			1.3	11.5	0.0	0.0	0.0		
			12:01:00									0.2			1.3	11.4	0.0	0.0	0.0		
			12:01:30									0.2			1.3	11.3	0.0	0.0	0.0		
			12:02:00									0.2			1.3	11.2	0.0	0.0	0.0		
			12:03:00									0.2			1.3	11.2	0.0	0.0	0.0		

				Gas and PID Monitoring Results															
Project ID:		GL22428A		Client:		Trustees of the Langmead Pension Scheme				Equipment		Model / Serial Number				Manufacturer's Calibration Date			
Date:		21/12/2018 - 08/01/2019		Location:		Land East of Drove Lane, Yapton				Gas Analyser:		GA5000 / 501752				22/05/2019			
Weather conditions:		Clear, Overcast		PID: Tiger Handheld VOC Detector / L-11292411/10/2019															
Pump Running Time (Purge): Standard 30 secs. Pump Running Time (Sampling): Standard 180 secs. Flow Details: 5 sec average for 1 min.										PID Details: "<" indicates reading is under the detection limit. ">" indicates reading is over the upper limit. "***" level to be determined.									
Field engineer(s): S. Hedges/ I. Reid				Remarks:															
Location ID	Monitoring Pipe and Diameter	Date Monitored	Time	Air Temp (°C)	Atmospheric Pressure 48Hrs Prior to Sampling (mB)	Atmospheric Pressure 24Hrs Prior to Sampling (mB)	Atmospheric Pressure 3Hrs Prior to Sampling (mB)	Atmospheric Pressure When Sampled (mB)	Relative Pressure (mB)	Peak PID (ppm)	Stable PID (ppm)	Methane (%)	Peak Methane (%)	Methane LEL (%)	Carbon Dioxide (%)	Oxygen (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	Flow (l/hr)
WS211	PIPE1 (50mm)	21/12/2018	09:45:00	8.0	1004	1007	998	999	-0.1	0.0	0.0	0.2	0.2	1.0	0.4	18.2	0.0		0.0
			09:45:15							0.1	0.0	0.2			0.3	19.3	0.0		0.0
			09:45:30							0.3	0.0	0.2			0.2	19.5	0.0		0.0
			09:45:45							0.1	0.0	0.2			0.2	19.9	0.0		0.0
			09:46:00							0.0	0.0	0.2			0.1	20.0	0.0		0.0
			09:46:30							0.0	0.0	0.2			0.1	20.8	0.0		0.0
			09:47:00							0.0	0.0	0.2			0.1	20.8	0.0		0.0
			09:48:00							0.0	0.0	0.2			0.1	20.8	0.0		0.0
		08/01/2019	12:45:00	10.0	1033	1026	1010	1026	0.3			0.2	0.2	1.0	0.1	21.3	0.0	0.0	0.0
			12:45:15									0.2			0.4	19.9	0.0	0.0	0.0
			12:45:30									0.2			0.4	18.2	0.0	0.0	0.0
			12:45:45									0.2			0.3	18.4	0.0	0.0	0.0
			12:46:00									0.2			0.3	18.7	0.0	0.0	0.0
			12:46:30									0.2			0.3	19.0	0.0	0.0	0.0
			12:47:00									0.2			0.3	19.0	0.0	0.0	0.0
			12:48:00									0.2			0.3	19.0	0.0	0.0	0.0

					Gas and PID Monitoring Results																
Project ID: GL22428A					Client: Trustees of the Langmead Pension Scheme					Equipment Model / Serial Number					Manufacturer's Calibration Date						
Date: 05/02/2019					Location: Land East of Drove Lane, Yapton					Gas Analyser: GA5000 / 504267					22/05/2019						
Weather conditions: Wet										PID: Tiger Handheld VOC Detector / T-113655					11/10/2019						
Pump Running Time (Purge): Standard 30 secs. Pump Running Time (Sampling): Standard 180 secs. Flow Details: 5 sec average for 1 min.										PID Details: "<" indicates reading is under the detection limit. ">" indicates reading is over the upper limit. "**" level to be determined.											
Field engineer(s): Sam Hedges					Remarks:																
Location ID	Monitoring Pipe and Diameter	Date Monitored	Time	Air Temp (°C)	#N/A	#N/A	#N/A	Atmospheric Pressure When Sampled (mB)	Relative Pressure (mB)	Peak PID (ppm)	Stable PID (ppm)	Methane (%)	Peak Methane (%)	Methane LEL (%)	Carbon Dioxide (%)	Oxygen (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	Flow (l/hr)	Remarks	
WS06	PIPE1 (50mm)	05/02/2019	11:50:00	6.0				1025	0.2	0.0	0.0	0.1	0.1	0.5	0.3	20.7	0.0	0.0	0.0		
			11:50:15							0.2			0.1			0.7	20.5	0.0	0.0	0.0	
			11:50:30							0.1			0.1			0.7	20.3	0.0	0.0	0.0	
			11:50:45							0.1			0.1			0.7	20.2	0.0	0.0	0.0	
			11:51:00							0.0			0.1			0.7	20.2	0.0	0.0	0.0	
			11:51:30							0.0			0.1			0.7	20.2	0.0	0.0	0.0	
			11:52:00							0.0			0.1			0.7	20.2	0.0	0.0	0.0	
			11:53:00							0.0			0.1			0.7	20.2	0.0	0.0	0.0	
WS10	PIPE1 (50mm)	05/02/2019	12:30:00	6.0				1025	-0.1	0.1	0.0	0.1	0.1	0.5	0.2	21.2	0.0	0.0	0.0		
			12:30:15							0.1			0.1			2.5	20.7	0.0	0.0	0.0	
			12:30:30							0.1			0.1			2.5	19.6	0.0	0.0	0.0	
			12:30:45							0.0			0.1			2.5	19.4	0.0	0.0	0.0	
			12:31:00							0.0			0.1			2.5	19.3	0.0	0.0	0.0	
			12:31:30							0.0			0.0			2.5	19.3	0.0	0.0	0.0	
			12:32:00							0.0			0.0			2.5	19.3	0.0	0.0	0.0	
			12:33:00							0.0			0.0			2.5	19.3	0.0	0.0	0.0	
WS202	PIPE1 (50mm)	05/02/2019	13:00:00	6.0				1025	0.0	0.0	0.1	0.1	0.1	0.5	0.3	21.2	0.0	0.0	0.0		
			13:00:15							0.3			0.1			1.9	20.1	0.0	0.0	0.0	
			13:00:30							0.2			0.1			1.7	18.7	0.0	0.0	0.0	
			13:00:45							0.2			0.1			1.6	18.6	0.0	0.0	0.0	
			13:01:00							0.1			0.1			1.6	18.7	0.0	0.0	0.0	
			13:01:30							0.1			0.1			1.5	18.7	0.0	0.0	0.0	
			13:02:00							0.1			0.1			1.5	18.7	0.0	0.0	0.0	
			13:03:00							0.1			0.1			1.5	18.7	0.0	0.0	0.0	
WS208	PIPE1 (50mm)	05/02/2019	12:45:00	6.0				1025	0.2	0.1	0.1	0.0	0.1	0.5	0.5	20.9	0.0	0.0	0.0		
			12:45:15							0.2			0.1			1.3	20.0	0.0	0.0	0.0	
			12:45:30							0.2			0.1			1.4	18.5	0.0	0.0	0.0	
			12:45:45							0.1			0.1			1.4	18.1	0.0	0.0	0.0	
			12:46:00							0.1			0.1			1.4	18.1	0.0	0.0	0.0	
			12:46:30							0.1			0.1			1.4	18.0	0.0	0.0	0.0	
			12:47:00							0.1			0.1			1.4	18.0	0.0	0.0	0.0	
			12:48:00							0.1			0.1			1.4	18.0	0.0	0.0	0.0	
WS210	PIPE1 (50mm)	05/02/2019	11:30:00	6.0				1025	0.1	0.0	0.0	0.1	0.1	0.5	0.3	20.6	0.0	0.0	0.0		
			11:30:15							0.2			0.0			3.1	18.8	0.0	0.0	0.0	
			11:30:30							0.2			0.0			3.2	16.2	0.0	0.0	0.0	
			11:30:45							0.2			0.0			3.2	15.2	0.0	0.0	0.0	
			11:31:00							0.1			0.0			3.2	15.0	0.0	0.0	0.0	
			11:31:30							0.1			0.0			3.3	14.7	0.0	0.0	0.0	
			11:32:00							0.0			0.0			3.4	14.4	0.0	0.0	0.0	
			11:33:00							0.0			0.0			3.6	14.0	0.0	0.0	0.0	
WS211	PIPE1 (50mm)	05/02/2019	12:10:00	6.0				1025	0.2	0.1	0.1	0.0	0.1	0.5	0.4	20.8	0.0	0.0	0.0		
			12:10:15							0.3			0.0			0.8	20.6	0.0	0.0	0.0	
			12:10:30							0.3			0.1			0.7	20.0	0.0	0.0	0.0	
			12:10:45							0.2			0.1			0.5	20.3	0.0	0.0	0.0	
			12:11:00							0.1			0.1			0.4	20.5	0.0	0.0	0.0	
			12:11:30							0.1			0.1			0.3	20.7	0.0	0.0	0.0	
			12:12:00							0.1			0.1			0.3	20.8	0.0	0.0	0.0	
			12:13:00							0.1			0.1			0.3	20.8	0.0	0.0	0.0	

				Gas and PID Monitoring Results																	
Project ID: GL22428A		Client: Trustees of the Langmead Pension Scheme		Equipment		Model / Serial Number										Manufacturer's Calibration Date					
Date: 06/03/2019		Location: Land East of Drove Lane, Yapton		Gas Analyser: GA5000 / 504267		22/05/2018															
Weather conditions: Dry				PID: Tiger Handheld VOC Detector / T-113655		11/10/2018															
Pump Running Time (Purge): Standard 30 secs. Pump Running Time (Sampling): Standard 180 secs. Flow Details: 5 sec average for 1 min.												PID Details: "<" indicates reading is under the detection limit. ">" indicates reading is over the upper limit. "***" level to be determined.									
Field engineer(s): Joe Sparks					Remarks:																
Location ID	Monitoring Pipe and Diameter	Date Monitored	Time	Air Temp (°C)	#N/A	#N/A	#N/A	Atmospheric Pressure When Sampled (mB)	Relative Pressure (mB)	Peak PID (ppm)	Stable PID (ppm)	Methane (%)	Peak Methane (%)	Methane LEL (%)	Carbon Dioxide (%)	Oxygen (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	Flow (l/hr)	Remarks	
WS06	PIPE1 (50mm)	06/03/2019	13:40:00					989	-4.2	0.4	1.1	0.1	0.1	0.5	0.2	20.4	1.0	0.0	0.0		
			13:40:15							0.9		0.1			4.1	15.6	0.0	0.0	0.0		
			13:40:30							1.0		0.1			4.2	14.5	0.0	0.0	0.0		
			13:40:45							1.1		0.1			4.2	14.2	0.0	0.0	0.0		
			13:41:00							1.1		0.1			4.2	14.1	0.0	0.0	0.0		
			13:41:30							1.1		0.1			4.2	14.1	0.0	0.0	0.0		
			13:42:00							1.1		0.1			4.1	14.1	0.0	0.0	0.0		
			13:43:00						1.1		0.1			4.1	14.1	0.0	0.0	0.0			
WS10	PIPE1 (50mm)	06/03/2019	14:00:00					989	-4.1	0.1	0.4	0.1	0.1	0.5	0.3	20.8	0.0	0.0	0.0		
			14:00:15							0.5		0.1			1.0	20.4	0.0	0.0	0.0		
			14:00:30							0.5		0.1			1.0	20.1	0.0	0.0	0.0		
			14:00:45							0.5		0.1			1.0	20.1	0.0	0.0	0.0		
			14:01:00							0.5		0.1			1.0	20.1	0.0	0.0	0.0		
			14:01:30							0.5		0.1			1.0	20.1	0.0	0.0	0.0		
			14:02:00							0.4		0.1			1.0	20.1	0.0	0.0	0.0		
			14:03:00						0.4		0.1			1.0	20.1	0.0	0.0	0.0			
WS202	PIPE1 (50mm)	06/03/2019	13:00:00					990	-2.3	0.3	0.2	0.1	0.1	0.5	0.3	20.5	0.0	0.0	0.0		
			13:00:15							0.5		0.1			2.9	15.9	0.0	0.0	0.0		
			13:00:30							0.7		0.1			2.7	14.6	0.0	0.0	0.0		
			13:00:45							0.3		0.0			2.7	14.6	0.0	0.0	0.0		
			13:01:00							0.2		0.0			2.7	14.6	0.0	0.0	0.0		
			13:01:30							0.2		0.0			2.7	14.5	0.0	0.0	0.0		
			13:02:00							0.2		0.0			2.7	14.5	0.0	0.0	0.0		
			13:03:00						0.1		0.0			2.7	14.5	0.0	0.0	0.0			
WS208	PIPE1 (50mm)	06/03/2019	12:30:00					990	-5.0	0.5	0.3	0.1	0.1	0.5	0.2	20.9	0.0	0.0	0.0		
			12:30:15							0.5		0.0			1.6	18.5	0.0	0.0	0.0		
			12:30:30							0.4		0.0			1.6	16.9	0.0	0.0	0.0		
			12:30:45							0.4		0.0			1.6	16.5	0.0	0.0	0.0		
			12:31:00							0.3		0.0			1.6	16.4	0.0	0.0	0.0		
			12:31:30							0.3		0.0			1.6	16.4	0.0	0.0	0.0		
			12:33:00							0.3		0.0			1.6	16.3	0.0	0.0	0.0		
WS210	PIPE1 (50mm)	06/03/2019	11:45:00					990	-3.8	0.1	0.0	0.1	0.1	0.5	0.0	20.2	0.0	0.0	0.0		
			11:45:15							0.5		0.0			0.2	13.8	0.0	0.0	0.0		
			11:45:30							0.4		0.0			3.8	12.0	0.0	0.0	0.0		
			11:45:45							0.3		0.0			3.8	12.4	0.0	0.0	0.0		
			11:46:00							0.3		0.0			3.9	12.3	0.0	0.0	0.0		
			11:46:30							0.1		0.0			3.9	12.2	0.0	0.0	0.0		
			11:47:00							0.0		0.0			3.9	12.1	0.0	0.0	0.0		
			11:48:00					0.0		0.0			4.0	11.9	0.0	0.0	0.0				
WS211	PIPE1 (50mm)	06/03/2019	11:00:15							0.3		0.0			0.7	20.6	0.0	0.0	0.0		
			12:00:00					991	-3.6	0.1	0.1	0.1	0.1	0.5	0.3	20.8	0.0	0.0	0.0		
			12:00:30							0.2		0.0			0.6	19.8	0.0	0.0	0.0		
			12:00:45							0.2		0.0			0.5	20.0	0.0	0.0	0.0		
			12:01:00							0.2		0.0			0.5	20.2	0.0	0.0	0.0		
			12:01:30							0.1		0.0			0.4	20.5	0.0	0.0	0.0		
			12:02:00							0.1		0.0			0.3	20.6	0.0	0.0	0.0		
			12:03:00						0.1		0.0			0.2	20.6	0.0	0.0	0.0			

				Gas and PID Monitoring Results																	
Project ID: GL22428A				Client: Trustees of the Langmead Pension Scheme				Equipment Model / Serial Number				Manufacturer's Calibration Date									
Date: 03/04/2019				Location: Land East of Drove Lane, Yapton				Gas Analyser: GA5000 / 501572				22/05/2018									
Weather conditions: Cloudy and dry, wet ground.				PID: Tiger Handheld VOC Detector / T-113655, Tiger Handheld VOC Detector / T-113656, Tiger Handheld VOC Detector / T-113656				11/10/2018													
Pump Running Time (Purge): Standard 30 secs. Pump Running Time (Sampling): Standard 180 secs. Flow Details: 5 sec average for 1 min.								PID Details: "<" indicates reading is under the detection limit. ">" indicates reading is over the upper limit. "**" level to be determined.													
Field engineer(s): Joe Sparks				Remarks:																	
Location ID	Monitoring Pipe and Diameter	Date Monitored	Time	Air Temp (°C)	Atmospheric Pressure 3Hrs Prior to Sampling (mB)	#N/A	#N/A	Atmospheric Pressure When Sampled (mB)	Relative Pressure (mB)	Peak PID (ppm)	Stable PID (ppm)	Methane (%)	Peak Methane (%)	Methane LEL (%)	Carbon Dioxide (%)	Oxygen (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	Flow (l/hr)	Remarks	
WS06	PIPE1 (50mm)	03/04/2019	16:40:00	6.0	999			999	0.3	0.0	0.3	0.2	0.2	1.0	0.0	21.0	0.0	0.0	0.0		
			16:40:15						0.4		0.2			1.4	20.1	0.0	0.0	0.0			
			16:40:30						0.4		0.2			1.4	19.1	0.0	0.0	0.0			
			16:40:45						0.3		0.2			1.4	19.0	0.0	0.0	0.0			
			16:41:00						0.3		0.2			1.4	19.0	0.0	0.0	0.0			
			16:41:30						0.3		0.2			1.4	18.9	0.0	0.0	0.0			
			16:42:00						0.3		0.2			1.4	18.9	0.0	0.0	0.0			
			16:43:00						0.3		0.2			1.4	18.9	0.0	0.0	0.0			
			WS10	PIPE1 (50mm)	03/04/2019	16:20:00	6.0	999			999	0.2	0.2	0.3	0.2	0.2	1.0	2.9	21.2	0.0	0.0
16:20:15									0.4		0.2			2.9	20.5	0.0	0.0	0.0			
16:20:30									0.4		0.2			3.0	18.1	0.0	0.0	0.0			
16:20:45									0.4		0.2			3.0	17.7	0.0	0.0	0.0			
16:21:00									0.4		0.2			3.0	17.6	0.0	0.0	0.0			
16:21:30									0.4		0.2			3.0	17.5	0.0	0.0	0.0			
16:22:00									0.4		0.2			3.0	17.5	0.0	0.0	0.0			
16:23:00									0.3		0.2			3.0	17.1	0.0	0.0	0.0			
WS202	PIPE1 (50mm)	03/04/2019				11:40:00	6.0	999			998	-0.1	0.1	0.3	0.1	0.2	1.0	2.0	20.1	0.0	0.0
			11:40:15						0.4		0.2			4.1	14.0	0.0	0.0	0.0			
			11:40:30						0.4		0.2			4.1	13.0	0.0	0.0	0.0			
			11:40:45						0.3		0.2			4.1	12.7	0.0	0.0	0.0			
			11:41:00						0.4		0.2			4.1	12.7	0.0	0.0	0.0			
			11:41:30						0.3		0.2			4.1	12.7	0.0	0.0	0.0			
			11:42:00						0.3		0.2			4.1	12.6	0.0	0.0	0.0			
			11:43:00						0.3		0.2			4.2	12.6	0.0	0.0	0.0			
			WS208	PIPE1 (50mm)	03/04/2019	12:00:00	6.0	999			999	0.1	0.0	0.0	0.1	0.1	0.5	0.1	20.0	0.0	0.0
12:00:15									0.3		0.1			1.9	10.7	0.0	0.0	0.0			
12:00:30									0.3		0.1			1.9	10.5	0.0	0.0	0.0			
12:00:45									0.1		0.1			1.9	10.5	0.0	0.0	0.0			
12:01:00									0.1		0.1			1.9	10.4	0.0	0.0	0.0			
12:01:30									0.0		0.1			1.9	10.4	0.0	0.0	0.0			
12:02:00									0.0		0.1			1.9	10.4	0.0	0.0	0.0			
12:03:00									0.0		0.1			1.9	10.4	0.0	0.0	0.0			
WS210	PIPE1 (50mm)	03/04/2019				10:55:00	6.0	999			999	0.2	0.2	0.5	0.2	0.2	1.0	0.0	19.8	0.0	0.0
			10:55:15						0.6		0.2			5.0	16.4	0.0	0.0	0.0			
			10:55:30						0.6		0.2			5.0	13.1	0.0	0.0	0.0			
			10:55:45						0.5		0.2			5.0	12.2	0.0	0.0	0.0			
			10:56:00						0.6		0.2			5.0	12.1	0.0	0.0	0.0			
			10:56:30						0.5		0.2			5.1	12.0	0.0	0.0	0.0			
			10:57:00						0.5		0.2			5.1	12.0	0.0	0.0	0.0			
			10:58:00						0.5		0.2			5.1	12.0	0.0	0.0	0.0			
			WS211	PIPE1 (50mm)	03/04/2019	10:25:00	6.0	999			999	-6.2	0.6	0.2	0.2	0.2	1.0	2.3	20.2	0.0	0.0
10:25:15									0.6		0.2			2.3	14.0	0.0	0.0	0.0			
10:25:30									0.4		0.2			2.3	11.0	0.0	0.0	0.0			
10:25:45									0.4		0.2			2.3	10.6	0.0	0.0	0.0			
10:26:00									0.4		0.2			2.3	10.3	0.0	0.0	0.0			
10:26:30									0.3		0.2			2.3	10.2	0.0	0.0	0.0			
10:27:00									0.2		0.2			2.3	10.2	0.0	0.0	0.0			
10:28:00									0.2		0.2			2.3	10.2	0.0	0.0	0.0			



Site Name: Land East of Drove Lane, Yapton

Job No.: GL22428A

Client: Trustees of the Langmead Pension Scheme c/o Landlink Estates Ltd

Weather (include Temperature & Pressure): Cloudy, wet

State of Ground: Wet

Field Engineer:	SH
1 - All (mbgl) depth measurements are recorded as meters below ground level.	
2 - I = Inertial, S = Submersible, B = Bailer, P = Peristaltic Pump.	
3 - Purge volume standardization: 50mm standpipe = 6 times water column, 35mm = 3.5 times water column, 19mm = 1 times water column	



Site Name: Land East of Drove Lane, Yapton | Job No.: GL22428A

Site Name: Land East of Drove Lane, Yapton

Job No.: GL22428A

Weather (include Temperature & Pressure): Clear, dry

State of Ground: Dry

Field Engineer:	IR
1 - All (mbgl) depth measurements are recorded as meters below ground level.	
2 - I = Inertial, S = Submersible, B = Bailer, P = Peristaltic Pump.	
3 - Purge volume standardization: 50mm standpipe = 6 times water column, 35mm = 3.5 times water column, 19mm = 1 times water column	

Harrison Group Environmental Ltd. Unit 12
Waterways Business Centre
Enfield
EN3 6JJ



Site Name: Land East of Drove Lane, Yapton

Job No.: GL22428A

Client: Trustees of the Langmead Pension Scheme c/o Landlink Estates Ltd

Weather (include Temperature & Pressure): Clear, dry

State of Ground: Mostly dry, some standing water

[illegible]

Field Engineer:	IR
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1 - All (mbgl) depth measurements are recorded as meters below ground level.

2 - I = Inertial, S = Submersible, B = Bailer, P = Peristaltic Pump.

3 - Purge volume standardization: 50mm standpipe = 6 times water column, 35mm = 3.5 times water column, 19mm = 1 times water column

				Groundwater Monitoring Results																											
Project ID: GL22428A				Client: Trustees of the Langmead Pension Scheme								Weather conditions: Cloudy and dry																			
Date: 06/03/2019				Location: Land East of Drove Lane, Yapton								Ground conditions: Dry																			
¹ = All (m) depth measurements are recorded as meters from the top of the installation cover.												² = I: Inertial, S: Submersible, B: Bailer, P: Peristaltic Pump.						³ = Purge volume standardisation: 50mm standpipe = 6 x water column, 35mm = 3.5 x water column, 19mm = 1 x water column.													
Field engineer(s): Joe Sparks												Remarks:																			
Location ID	Monitoring Pipe and Diameter	Date Monitored	Time	Surface Elevation (maOD)	LNAPL Depth ¹ (mbgl)	LNAPL Depth (maOD)	Water Level ¹ (mbgl)	Water Level (maOD)	DNAPL Depth ¹ (mbgl)	DNAPL Depth (maOD)	Depth to base ¹ (mbgl)	Depth to base (maOD)	Readings:											Sampling Method ² (I, S, B, P)	Water Column (m)	Purged Volume ³ (L)	Sample Ref	Comments: (e.g. problems encountered, standpipe conditions, unusual odours, colour, turbidity, sheens)			
WS06	PIPE1 (50mm)	06/03/2019					1.20				4.00			Barometric Pressure (mB)	Air Temp (°C)	Downhole Temp (°C)	pH	Electrical Conductivity (µS/cm)	DO (%)	Redox Potential (mV)	Resistivity (Ohm-cm)	Salinity (psu)	Density (g/cm³)	TDS (ppt)	Water Pressure (psi)		2.80				
WS10	PIPE1 (50mm)	06/03/2019					3.27				4.00																0.73				
WS201	PIPE1 (19mm)	06/03/2019		5.93			1.35	4.58			3.60	2.33															2.25				
WS202	PIPE1 (50mm)	06/03/2019		6.14			2.05	4.09			4.70	1.44															2.65				
WS203	PIPE1 (19mm)	06/03/2019		4.96			1.50	3.46			4.00	0.96															2.50				
WS204	PIPE1 (19mm)	06/03/2019		5.67			2.06	3.61			4.80	0.87															2.74				
WS205	PIPE1 (19mm)	06/03/2019		6.68			2.00	4.68			3.95	2.73															1.95				
WS206	PIPE1 (19mm)	06/03/2019		5.90			2.00	3.90			4.20	1.70															2.20				
WS207	PIPE1 (19mm)	06/03/2019		6.44			1.95	4.49			3.95	2.49															2.00				
WS208	PIPE1 (50mm)	06/03/2019		6.06			2.30	3.76			3.93	2.13															1.63				
WS209	PIPE1 (19mm)	06/03/2019		5.66			2.50	3.16			4.45	1.21															1.95				
WS210	PIPE1 (50mm)	06/03/2019		6.04			3.15	2.89			4.70	1.34															1.55				
WS211	PIPE1 (50mm)	06/03/2019		6.35			2.40	3.95			4.60	1.75															2.20				

				Groundwater Monitoring Results																									
Project ID: GL22428A				Client: Trustees of the Langmead Pension Scheme								Weather conditions: Cloudy, dry with showers																	
Date: 03/04/2019				Location: Land East of Drove Lane, Yapton								Ground conditions: Wet																	
¹ = All (m) depth measurements are recorded as meters from the top of the installation cover.										² = I: Inertial, S: Submersible, B: Bailer, P: Peristaltic Pump.					³ = Purge volume standardisation: 50mm standpipe = 6 x water column, 35mm = 3.5 x water column, 19mm = 1 x water column.														
Field engineer(s): Joe Sparks				Remarks:																									
Location ID	Monitoring Pipe and Diameter	Date Monitored	Time	Surface Elevation (maOD)	LNAPL Depth ¹ (mbgl)	LNAPL Depth (maOD)	Water Level ¹ (mbgl)	Water Level (maOD)	DNAPL Depth ¹ (mbgl)	DNAPL Depth (maOD)	Depth to base ¹ (mbgl)	Depth to base (maOD)	Readings:											Sampling Method ² (I, S, B, P)	Water Column (m)	Purged Volume ³ (L)	Sample Ref	Comments: (e.g. problems encountered, standpipe conditions, unusual odours, colour, turbidity, sheens)	
WS06	PIPE1 (50mm)	03/04/2019					1.90				4.00			Barometric Pressure (mB)	Air Temp (°C)	Downhole Temp (°C)	pH	Electrical Conductivity (µS/cm)	DO (%)	Redox Potential (mV)	Resistivity (Ohm-cm)	Salinity (psu)	Density (g/cm³)	TDS (ppt)	Water Pressure (psi)		2.10		
WS10	PIPE1 (50mm)	03/04/2019					3.42				4.00																0.58		
WS201	PIPE1 (19mm)	03/04/2019		5.93			1.65	4.28			3.60	2.33															1.95		
WS202	PIPE1 (50mm)	03/04/2019		6.14			2.70	3.44			4.70	1.44															2.00		
WS203	PIPE1 (19mm)	03/04/2019		4.96			1.58	3.38			4.00	0.96															2.42		
WS204	PIPE1 (19mm)	03/04/2019		5.67			2.45	3.22			4.80	0.87															2.35		
WS205	PIPE1 (19mm)	03/04/2019		6.68			2.03	4.65			3.95	2.73															1.92		
WS206	PIPE1 (19mm)	03/04/2019		5.90			2.20	3.70			4.20	1.70															2.00		
WS207	PIPE1 (19mm)	03/04/2019		6.44			1.92	4.52			3.95	2.49															2.03		
WS208	PIPE1 (50mm)	03/04/2019		6.06			2.05	4.01			3.93	2.13															1.88		
WS209	PIPE1 (19mm)	03/04/2019		5.66			2.61	3.05			4.45	1.21															1.84		
WS210	PIPE1 (50mm)	03/04/2019		6.04			3.80	2.24			4.70	1.34															0.90		
WS211	PIPE1 (50mm)	03/04/2019		6.35			2.90	3.45			4.60	1.75															1.70		

APPENDIX D

LABORATORY TESTING

Harrison Testing Services

Unit 1, Alston Road
Hellesdon Park Industrial Estate
Norwich NR6 5DS

Tel: +44 (0) 1603 416333
www.harrisongroupuk.com
Email: laboratory@harrisongroupuk.com

Harrison Group Environmental

12, Waterways Business Centre
Navigation Drive
Enfield
EN3 6JJ

For the attention of: John Keay

Page 1 of 1
Issue No: 01

Project: **Drove Lane, Yapton**
Report No: **GL22428A-01**
Your Ref: **GL22428A-01**

Samples received: 19/12/2018
Instruction received: 19/12/2018
Testing commenced: 07/01/2019

Please find results attached as summarised below.

Item	Description	Quantity	UKAS Accredited
1	Water Content	24	Yes
2	Liquid & Plastic Limits	12	Yes
3	Saturation Moisture Content	3	No
4	Particle Size Distribution - Wet Sieve Method	7	Yes

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Issued by:

Date Issued:



M. Willson

Laboratory Manager

25 January 2019



4031



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Registered in England No. 1306165 Registered Office: Kimberley Street, Norwich NR2 2RJ

DETERMINATION OF WATER CONTENT

BS EN ISO 17892 - 1 : 2014

Project Name:			Drove Lane, Yapton		Project Number:
Client Name:			Trustees of the Langmead Pension Scheme		GL22428A
Location	Depth m	Sample Ref	Sample Description	Water Content %	Remarks
WS201	0.50	D2	Brown CLAY	32.8	
WS202	0.50	B1	Brown CLAY	22.9	
WS203	1.00	D3	Orange brown CLAY	23.1	
WS204	1.00	D3	Orange brown CLAY	23.9	
WS204	3.00	D7	Grey brown slightly gravelly slightly sandy CLAY. Gravel is of flint and chalk	21.4	
WS205	0.50	B1	Brown CLAY	23.2	
WS206	0.50	B1	Orange brown CLAY.	24.0	
WS206	2.00	D5	Brown slightly gravelly slightly sandy CLAY. Gravel is of flint	24.9	
WS207	0.50	B1	Brown CLAY	22.9	
WS207	2.00	D5	Orange brown slightly gravelly CLAY. Gravel is of chalk.	21.5	
Notes: 1) Unless we are notified to the contrary, samples will be disposed after a period of one month from this date. 2) This report should not be reproduced except in full without the written approval of the laboratory. 3) Only those results indicated in this report are UKAS accredited and any opinion or interpretations expressed are outside the scope of UKAS accreditation.					
Remarks			Approved	Date	Sheet No.:
			MW M. Willson Laboratory Manager	25/01/2019	1 of 3



DETERMINATION OF WATER CONTENT

BS EN ISO 17892 - 1 : 2014

Project Name:			Drove Lane, Yapton		Project Number:
Client Name:			Trustees of the Langmead Pension Scheme		GL22428A
Location	Depth m	Sample Ref	Sample Description	Water Content %	Remarks
WS208	0.50	B1	Brown CLAY	22.9	
WS209	0.50	D2	Brown slightly gravelly CLAY. Gravel is of chalk.	22.5	
WS209	1.50	D4	Orange brown slightly gravelly slightly sandy CLAY. Gravel is of flint and chalk	19.9	
WS210	0.20	D1	Brown slightly gravelly CLAY. Gravel is of flint.	26.5	
WS210	0.50	B1	Brown slightly gravelly CLAY. Gravel is of chalk.	22.8	
WS210	0.50	D2	Orange brown slightly sandy CLAY.	22.1	
WS210	1.00	D3	Orange brown slightly sandy CLAY.	22.4	
WS210	1.50	D4	Orange brown slightly sandy CLAY.	21.8	
WS210	2.00	D5	Brown slightly sandy slightly gravelly CLAY. Gravel is of flint and claystone.	19.0	
WS210	2.50	D6	Orange brown slightly gravelly slightly sandy CLAY. Gravel is of flint and chalk	19.9	
Notes: 1) Unless we are notified to the contrary, samples will be disposed after a period of one month from this date. 2) This report should not be reproduced except in full without the written approval of the laboratory. 3) Only those results indicated in this report are UKAS accredited and any opinion or interpretations expressed are outside the scope of UKAS accreditation.					
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			MW M. Willson Laboratory Manager	25/01/2019	2 of 3



DETERMINATION OF WATER CONTENT

BS EN ISO 17892 - 1 : 2014

Project Name:			Drove Lane, Yapton		Project Number:
Client Name:			Trustees of the Langmead Pension Scheme		GL22428A
Location	Depth m	Sample Ref	Sample Description	Water Content %	Remarks
WS210	3.00	D7	Brown slightly sandy slightly gravelly CLAY. Gravel is of chalk.	17.9	
WS211	0.50	D2	Brown CLAY	24.3	
WS211	1.50	D4	Brown slightly sandy CLAY.	23.4	
WS211	2.50	D6	Orange brown , grey brown and brown CLAY	21.5	
Notes: 1) Unless we are notified to the contrary, samples will be disposed after a period of one month from this date. 2) This report should not be reproduced except in full without the written approval of the laboratory. 3) Only those results indicated in this report are UKAS accredited and any opinion or interpretations expressed are outside the scope of UKAS accreditation.					
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			MW M. Willson Laboratory Manager	25/01/2019	3 of 3



			DETERMINATION OF LIQUID LIMIT, PLASTIC LIMIT & PLASTICITY INDEX BS1377 : Part 2 : 1990						
Project Name:			Drove Lane, Yapton					Project Number:	
Client Name:			Trustees of the Langmead Pension Scheme					GL22428A	
Location	Depth m	Sample Ref	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	Percentage passing 425µm %	Classification	Sample Description
WS201	0.50	D2	33	40	20	20	100	CI	Brown CLAY
WS202	0.50	B1	23	43	21	22	100	CI	Brown CLAY
WS203	1.00	D3	23	38	20	18	100	CI	Orange brown CLAY
WS204	1.00	D3	24	41	20	21	100	CI	Orange brown CLAY
WS204	3.00	D7	21	25	15	10	91	CL	Grey brown slightly gravelly slightly sandy CLAY. Gravel is of flint and chalk
WS205	0.50	B1	23	34	21	13	100	CL	Brown CLAY
WS206	2.00	D5	25	37	17	20	100	CI	Brown slightly gravelly slightly sandy CLAY. Gravel is of flint
WS207	0.50	B1	23	33	20	13	100	CL	Brown CLAY
WS208	0.50	B1	23	36	22	14	100	CI	Brown CLAY
WS210	2.50	D6	20	28	16	12	88	CL	Orange brown slightly gravelly slightly sandy CLAY. Gravel is of flint and chalk

Notes:

- 1) This summary sheet is provided for convenience and in no way replaces individual test result sheets which shall, without exception, be regarded as the definitive result. Please refer to the individual test result sheets for the respective methods used.
- 2) Unless we are notified to the contrary, samples will be disposed after a period of one month from this date.
- 3) This report should not be reproduced except in full without the written approval of the laboratory.
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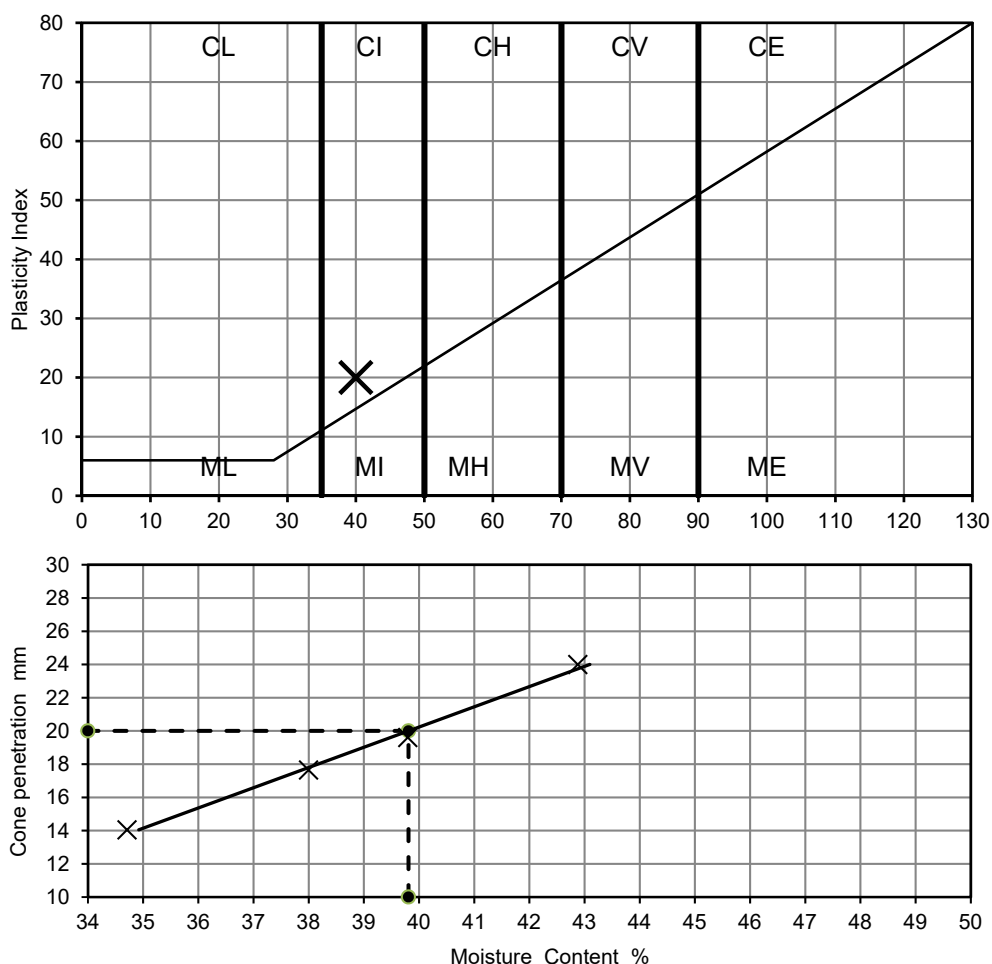
Remarks	Approved	Date	Sheet No.:
	MW M. Willson Laboratory Manager	25/01/2019	1 of 2

Project Name:			Drove Lane, Yapton						Project Number:	
Client Name:			Trustees of the Langmead Pension Scheme						GL22428A	
Location	Depth	Sample Ref	Moisture Content	Liquid Limit	Plastic Limit	Plasticity Index	Percentage passing 425µm	Classification	Sample Description	
	m		%	%	%		%			
WS211	0.50	D2	24	41	21	20	100	CI	Brown CLAY	
WS211	2.50	D6	22	33	18	15	100	CL	Orange brown, grey brown and brown CLAY	
Notes:										
1) This summary sheet is provided for convenience and in no way replaces individual test result sheets which shall, without exception, be regarded as the definitive result. Please refer to the individual test result sheets for the respective methods used.										
2) Unless we are notified to the contrary, samples will be disposed after a period of one month from this date.										
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							MW M. Willson Laboratory Manager		25/01/2019	
									Sheet No.:	
									2 of 2	

LIQUID LIMIT, PLASTIC LIMIT, PLASTICITY INDEX, & LIQUIDITY INDEX

BS 1377 : Part 2 : 1990, clause 4.3 and 5

Project Name:	Drove Lane, Yapton	Project Number:	GL22428A
Client Name:	Trustees of the Langmead Pension Scheme	Sample Location:	WS201
Sample Description:	Brown CLAY	Sample Depth (m)	0.50
		Sample Reference	D2



Preparation: Material was natural

Results: As Received Moisture Content: (BS1377 : Part 2 : Clause 3 : 1990) 33 %
 Percentage Passing 425µm sieve: 100 %
 Liquid Limit: 40 %
 Plastic Limit: 20 %
 Plasticity Index: 20
 Liquidity Index: 0.65
 Modified Plasticity Index: (NHBC Standards Chapter 4.2) 20

Notes:

- 1) Modified Plasticity Index: (NHBC Standards Chapter 4.2) not covered by UKAS accreditation.
- 2) Unless we are notified to the contrary, samples will be disposed after a period of one month from this date.
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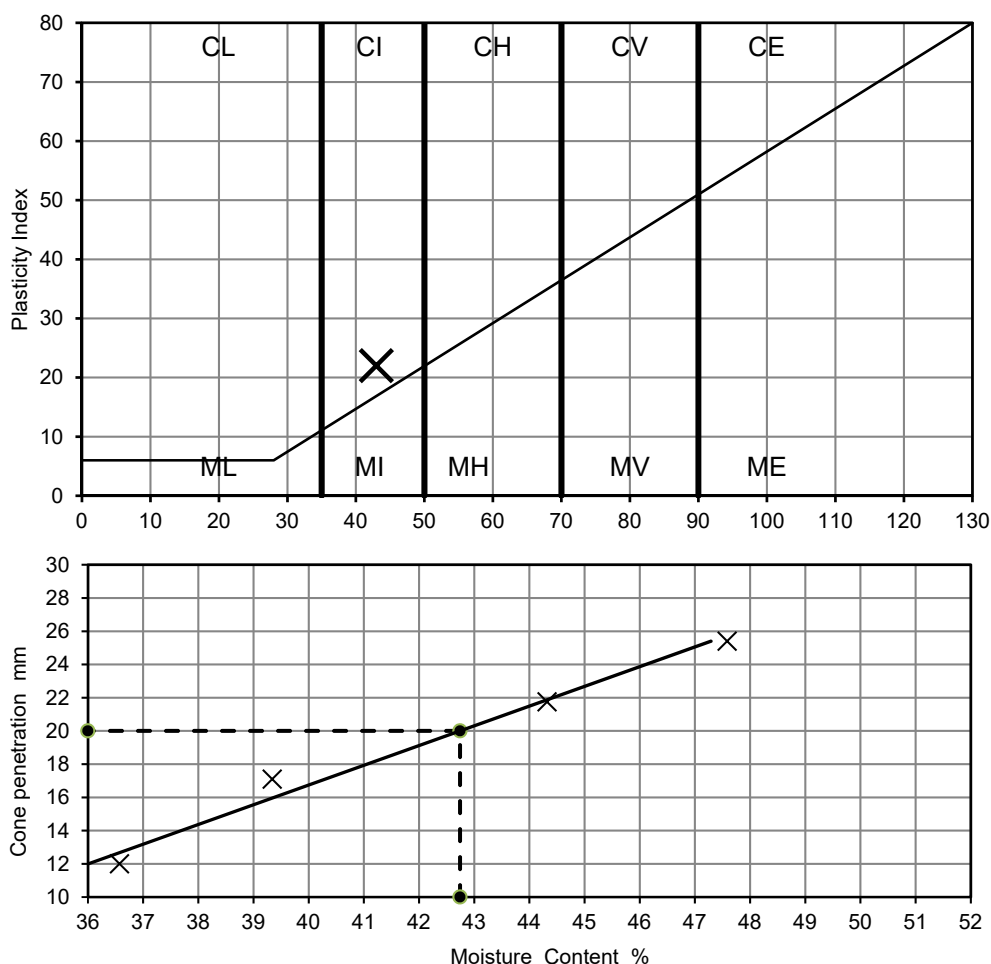


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LIQUID LIMIT, PLASTIC LIMIT, PLASTICITY INDEX, & LIQUIDITY INDEX

BS 1377 : Part 2 : 1990, clause 4.3 and 5

Project Name:	Drove Lane, Yapton	Project Number:	GL22428A
Client Name:	Trustees of the Langmead Pension Scheme	Sample Location:	WS202
Sample Description:	Brown CLAY	Sample Depth (m)	0.50
		Sample Reference	B1



Preparation: Material was natural

Results: As Received Moisture Content: (BS1377 : Part 2 : Clause 3 : 1990) 23 %
 Percentage Passing 425µm sieve: 100 %
 Liquid Limit: 43 %
 Plastic Limit: 21 %
 Plasticity Index: 22
 Liquidity Index: 0.09
 Modified Plasticity Index: (NHBC Standards Chapter 4.2) 22

Notes:

- 1) Modified Plasticity Index: (NHBC Standards Chapter 4.2) not covered by UKAS accreditation.
- 2) Unless we are notified to the contrary, samples will be disposed after a period of one month from this date.
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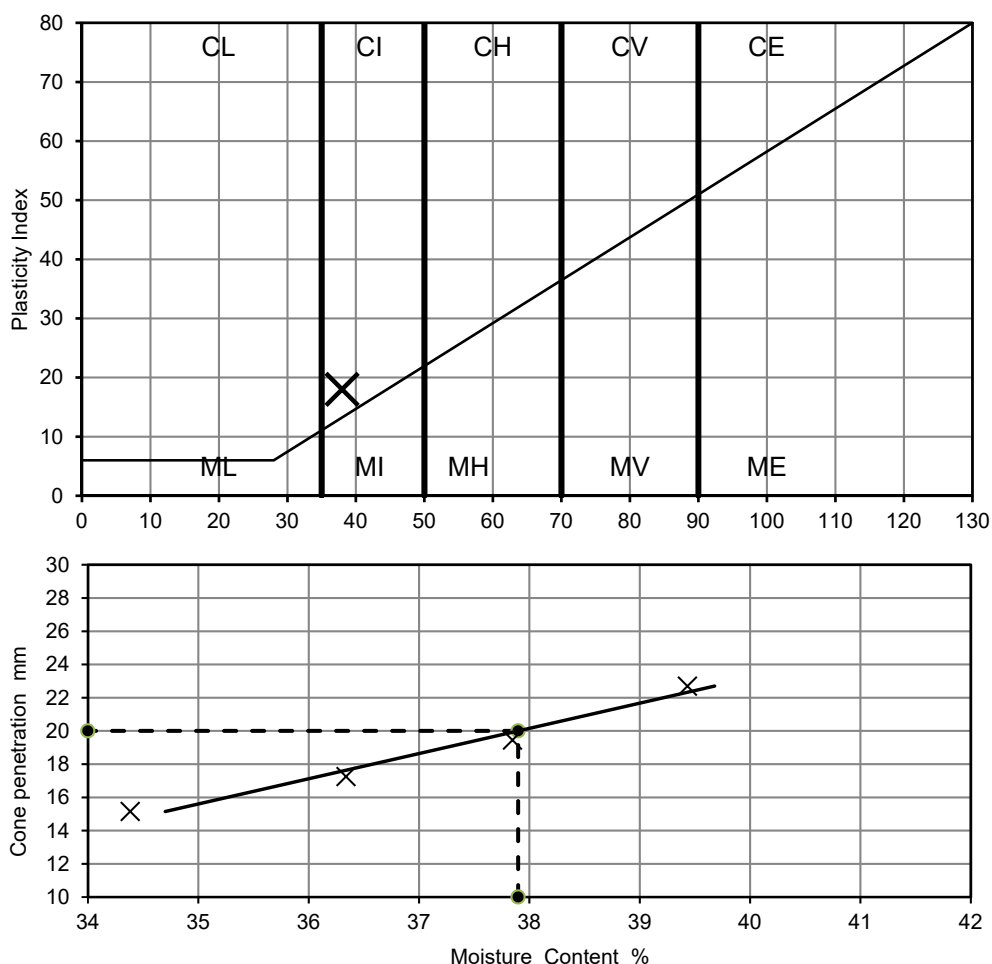


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LIQUID LIMIT, PLASTIC LIMIT, PLASTICITY INDEX, & LIQUIDITY INDEX

BS 1377 : Part 2 : 1990, clause 4.3 and 5

Project Name:	Drove Lane, Yapton	Project Number:	GL22428A
Client Name:	Trustees of the Langmead Pension Scheme	Sample Location:	WS203
Sample Description:	Orange brown CLAY	Sample Depth (m)	1.00
		Sample Reference	D3



Preparation: Material was natural

Results: As Received Moisture Content: (BS1377 : Part 2 : Clause 3 : 1990) 23 %
 Percentage Passing 425µm sieve: 100 %
 Liquid Limit: 38 %
 Plastic Limit: 20 %
 Plasticity Index: 18
 Liquidity Index: 0.17
 Modified Plasticity Index: (NHBC Standards Chapter 4.2) 18

Notes:

- 1) Modified Plasticity Index: (NHBC Standards Chapter 4.2) not covered by UKAS accreditation.
- 2) Unless we are notified to the contrary, samples will be disposed after a period of one month from this date.
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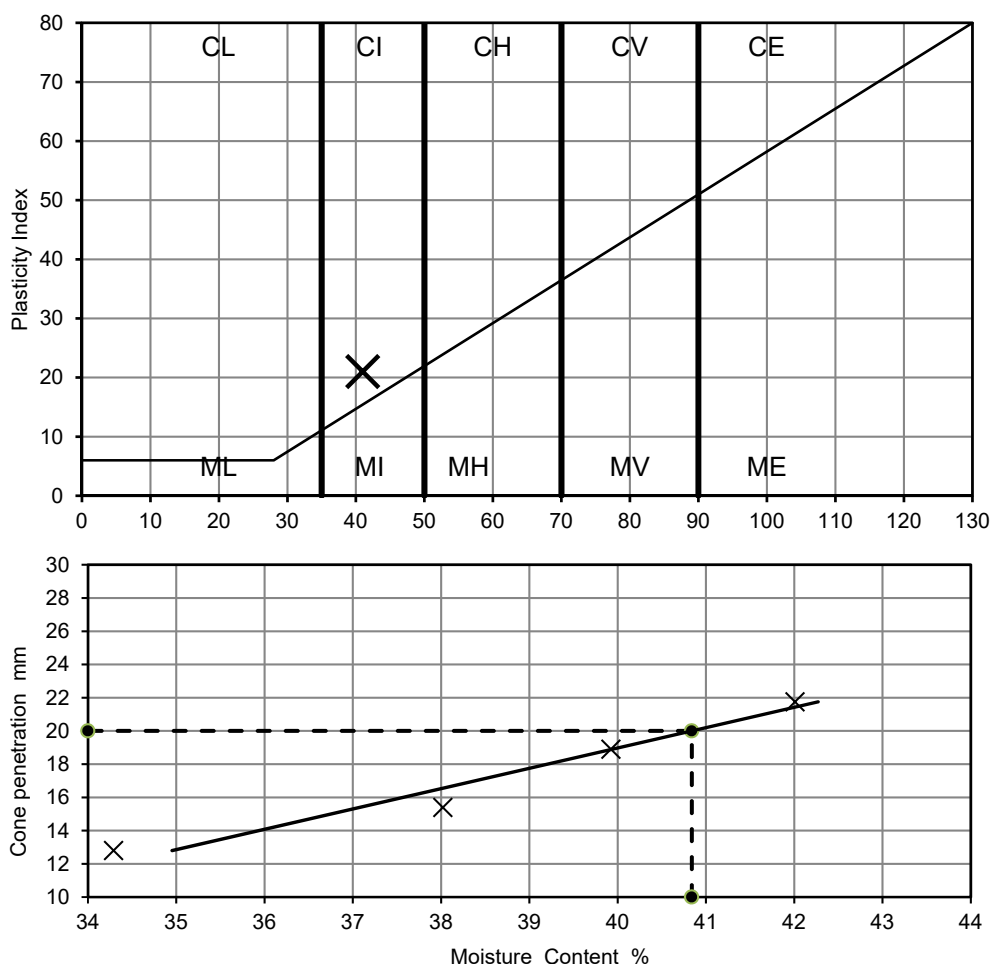


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LIQUID LIMIT, PLASTIC LIMIT, PLASTICITY INDEX, & LIQUIDITY INDEX

BS 1377 : Part 2 : 1990, clause 4.3 and 5

Project Name:	Drove Lane, Yapton	Project Number:	GL22428A
Client Name:	Trustees of the Langmead Pension Scheme	Sample Location:	WS204
Sample Description:	Orange brown CLAY	Sample Depth (m)	1.00
		Sample Reference	D3



Preparation: Material was natural

Results: As Received Moisture Content: (BS1377 : Part 2 : Clause 3 : 1990) 24 %
 Percentage Passing 425µm sieve: 100 %
 Liquid Limit: 41 %
 Plastic Limit: 20 %
 Plasticity Index: 21
 Liquidity Index: 0.19
 Modified Plasticity Index: (NHBC Standards Chapter 4.2) 21

Notes:

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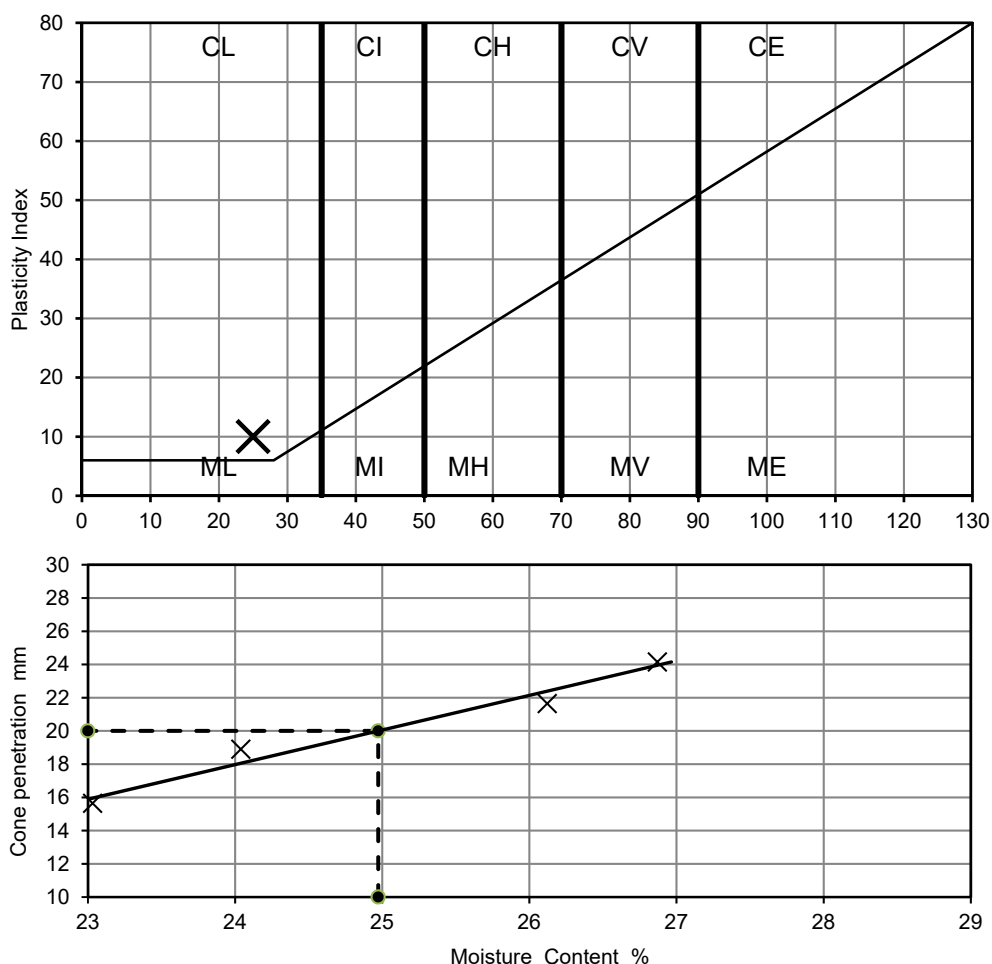


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LIQUID LIMIT, PLASTIC LIMIT, PLASTICITY INDEX, & LIQUIDITY INDEX

BS 1377 : Part 2 : 1990, clause 4.3 and 5

Project Name:	Drove Lane, Yapton	Project Number:	GL22428A
Client Name:	Trustees of the Langmead Pension Scheme	Sample Location:	WS204
Sample Description:	Grey brown slightly gravelly slightly sandy CLAY. Gravel is of flint and chalk	Sample Depth (m)	3.00
		Sample Reference	D7



Preparation: Material was washed and oven dried at below 50°C

Results: As Received Moisture Content: (BS1377 : Part 2 : Clause 3 : 1990) 21 %
 Percentage Passing 425µm sieve: 91 %
 Liquid Limit: 25 %
 Plastic Limit: 15 %
 Plasticity Index: 10
 Liquidity Index: 0.60
 Modified Plasticity Index: (NHBC Standards Chapter 4.2) 9

Notes:

- 1) Modified Plasticity Index: (NHBC Standards Chapter 4.2) not covered by UKAS accreditation.
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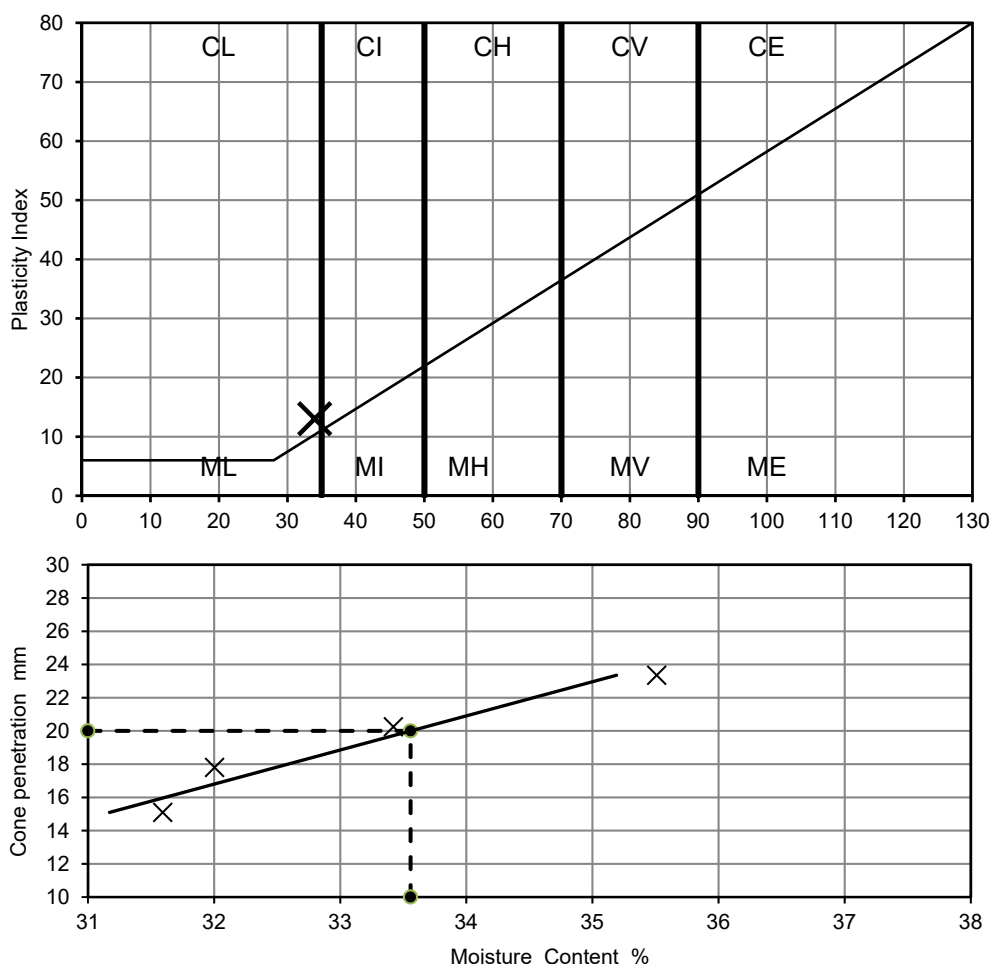


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LIQUID LIMIT, PLASTIC LIMIT, PLASTICITY INDEX, & LIQUIDITY INDEX

BS 1377 : Part 2 : 1990, clause 4.3 and 5

Project Name:	Drove Lane, Yapton	Project Number:	GL22428A
Client Name:	Trustees of the Langmead Pension Scheme	Sample Location:	WS205
Sample Description:	Brown CLAY	Sample Depth (m)	0.50
		Sample Reference	B1



Preparation: Material was natural

Results: As Received Moisture Content: (BS1377 : Part 2 : Clause 3 : 1990) 23 %
 Percentage Passing 425µm sieve: 100 %
 Liquid Limit: 34 %
 Plastic Limit: 21 %
 Plasticity Index: 13
 Liquidity Index: 0.15
 Modified Plasticity Index: (NHBC Standards Chapter 4.2) 13

Notes:

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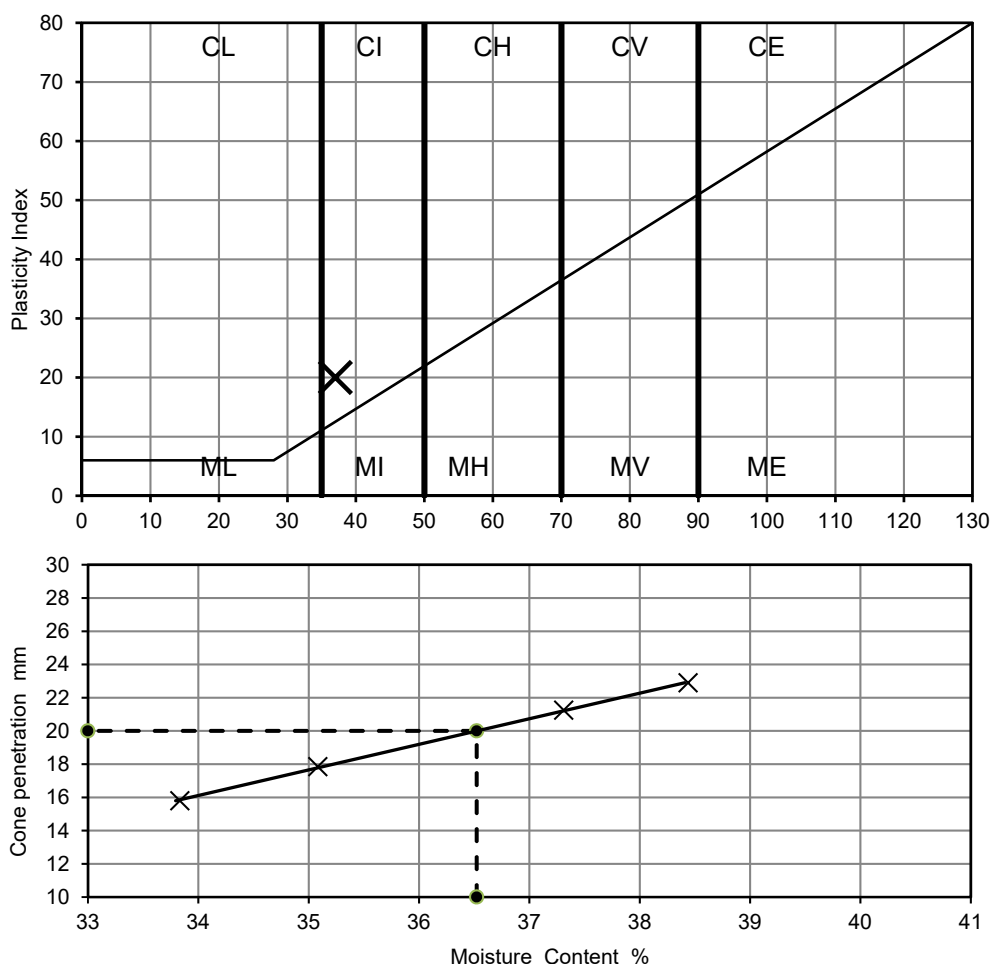


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LIQUID LIMIT, PLASTIC LIMIT, PLASTICITY INDEX, & LIQUIDITY INDEX

BS 1377 : Part 2 : 1990, clause 4.3 and 5

Project Name:	Drove Lane, Yapton	Project Number:	GL22428A
Client Name:	Trustees of the Langmead Pension Scheme	Sample Location:	WS206
Sample Description:	Brown slightly gravelly slightly sandy CLAY. Gravel is of flint	Sample Depth (m)	2.00
		Sample Reference	D5



Preparation: Material was washed and oven dried at below 50°C

Results:

As Received Moisture Content: (BS1377 : Part 2 : Clause 3 : 1990)	25 %
Percentage Passing 425µm sieve:	100 %
Liquid Limit:	37 %
Plastic Limit:	17 %
Plasticity Index:	20
Liquidity Index:	0.40
Modified Plasticity Index: (NHBC Standards Chapter 4.2)	20

Notes:

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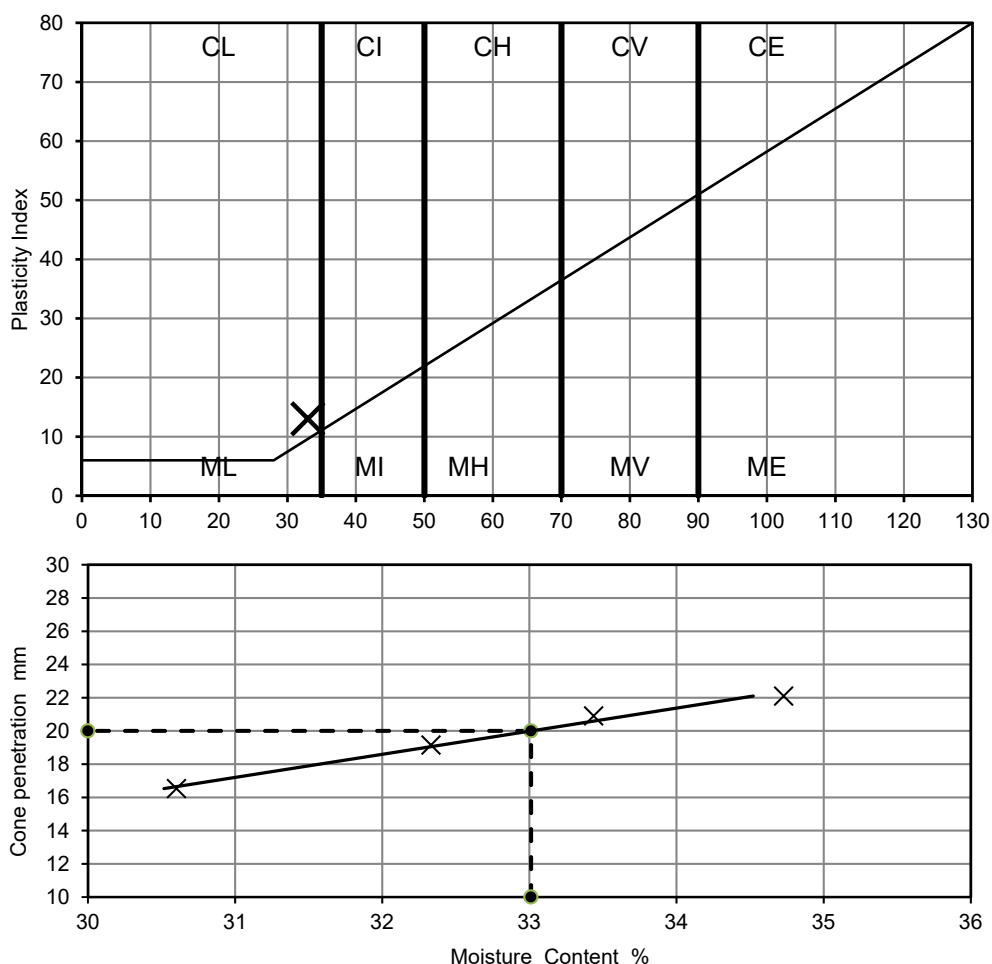


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LIQUID LIMIT, PLASTIC LIMIT, PLASTICITY INDEX, & LIQUIDITY INDEX

BS 1377 : Part 2 : 1990, clause 4.3 and 5

Project Name:	Drove Lane, Yapton	Project Number:	GL22428A
Client Name:	Trustees of the Langmead Pension Scheme	Sample Location:	WS207
Sample Description:	Brown CLAY	Sample Depth (m)	0.50
		Sample Reference	B1



Preparation: Material was natural

Results: As Received Moisture Content: (BS1377 : Part 2 : Clause 3 : 1990) 23 %
 Percentage Passing 425µm sieve: 100 %
 Liquid Limit: 33 %
 Plastic Limit: 20 %
 Plasticity Index: 13
 Liquidity Index: 0.23
 Modified Plasticity Index: (NHBC Standards Chapter 4.2) 13

Notes:

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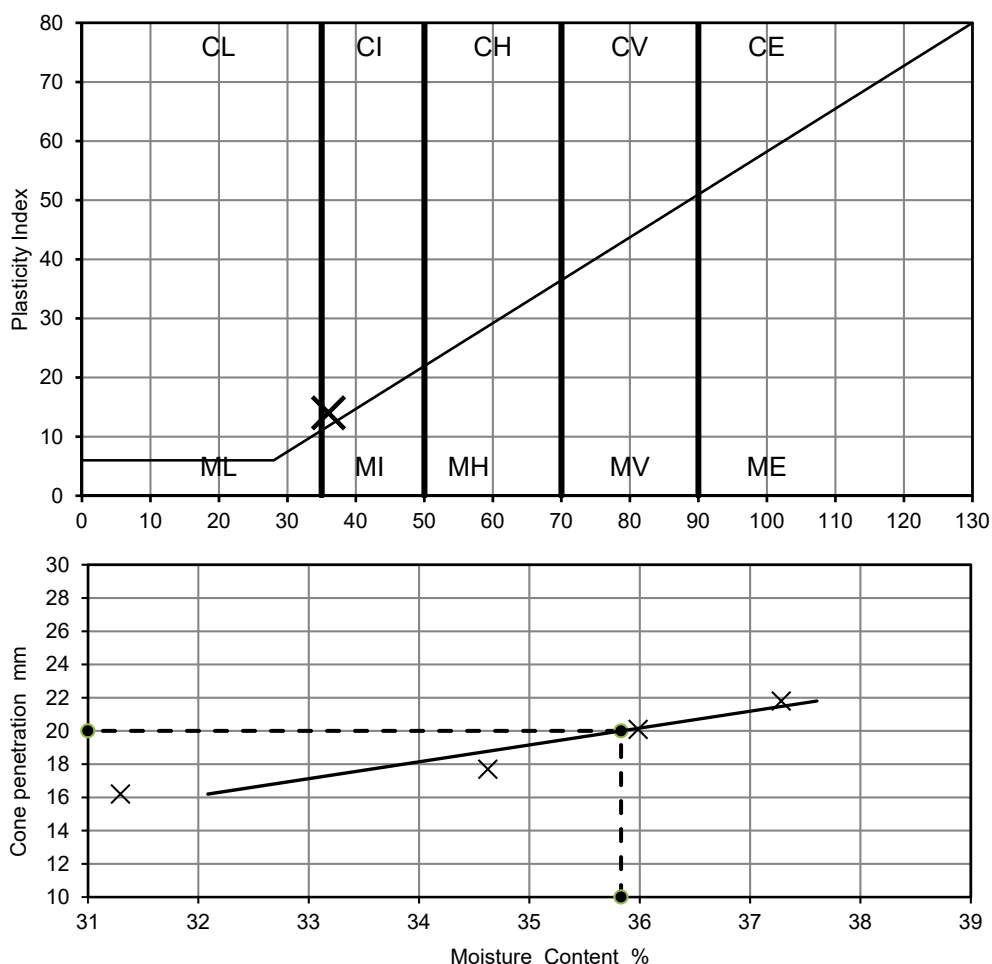


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LIQUID LIMIT, PLASTIC LIMIT, PLASTICITY INDEX, & LIQUIDITY INDEX

BS 1377 : Part 2 : 1990, clause 4.3 and 5

Project Name:	Drove Lane, Yapton	Project Number:	GL22428A
Client Name:	Trustees of the Langmead Pension Scheme	Sample Location:	WS208
Sample Description:	Brown CLAY	Sample Depth (m)	0.50
		Sample Reference	B1



Preparation: Material was washed and oven dried at below 50°C

Results: As Received Moisture Content: (BS1377 : Part 2 : Clause 3 : 1990) 23 %
 Percentage Passing 425µm sieve: 100 %
 Liquid Limit: 36 %
 Plastic Limit: 22 %
 Plasticity Index: 14
 Liquidity Index: 0.07
 Modified Plasticity Index: (NHBC Standards Chapter 4.2) 14

Notes:

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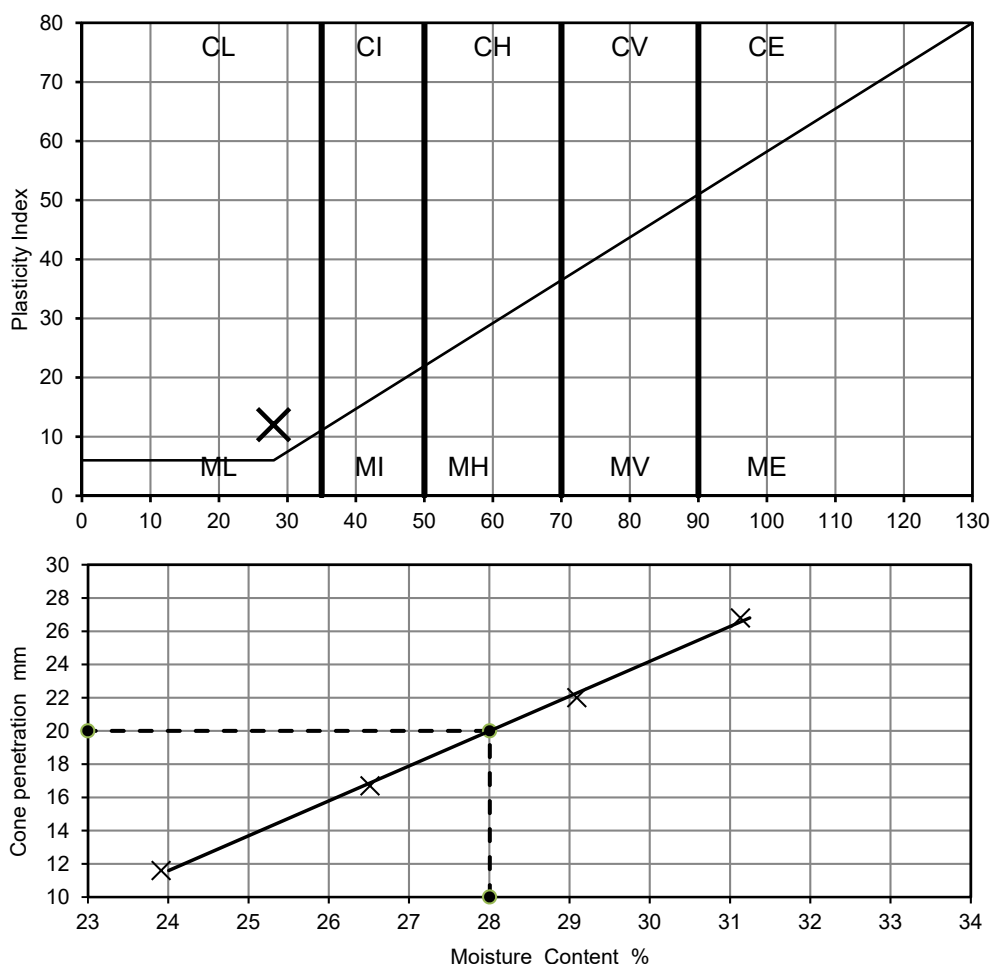


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LIQUID LIMIT, PLASTIC LIMIT, PLASTICITY INDEX, & LIQUIDITY INDEX

BS 1377 : Part 2 : 1990, clause 4.3 and 5

Project Name:	Drove Lane, Yapton	Project Number:	GL22428A
Client Name:	Trustees of the Langmead Pension Scheme	Sample Location:	WS210
Sample Description:	Orange brown slightly gravelly slightly sandy CLAY. Gravel is of flint and chalk	Sample Depth (m)	2.50
		Sample Reference	D6



Preparation: Material was washed and oven dried at below 50°C

Results: As Received Moisture Content: (BS1377 : Part 2 : Clause 3 : 1990) 20 %
 Percentage Passing 425µm sieve: 88 %
 Liquid Limit: 28 %
 Plastic Limit: 16 %
 Plasticity Index: 12
 Liquidity Index: 0.33
 Modified Plasticity Index: (NHBC Standards Chapter 4.2) 11

Notes:

- 1) Modified Plasticity Index: (NHBC Standards Chapter 4.2) not covered by UKAS accreditation.
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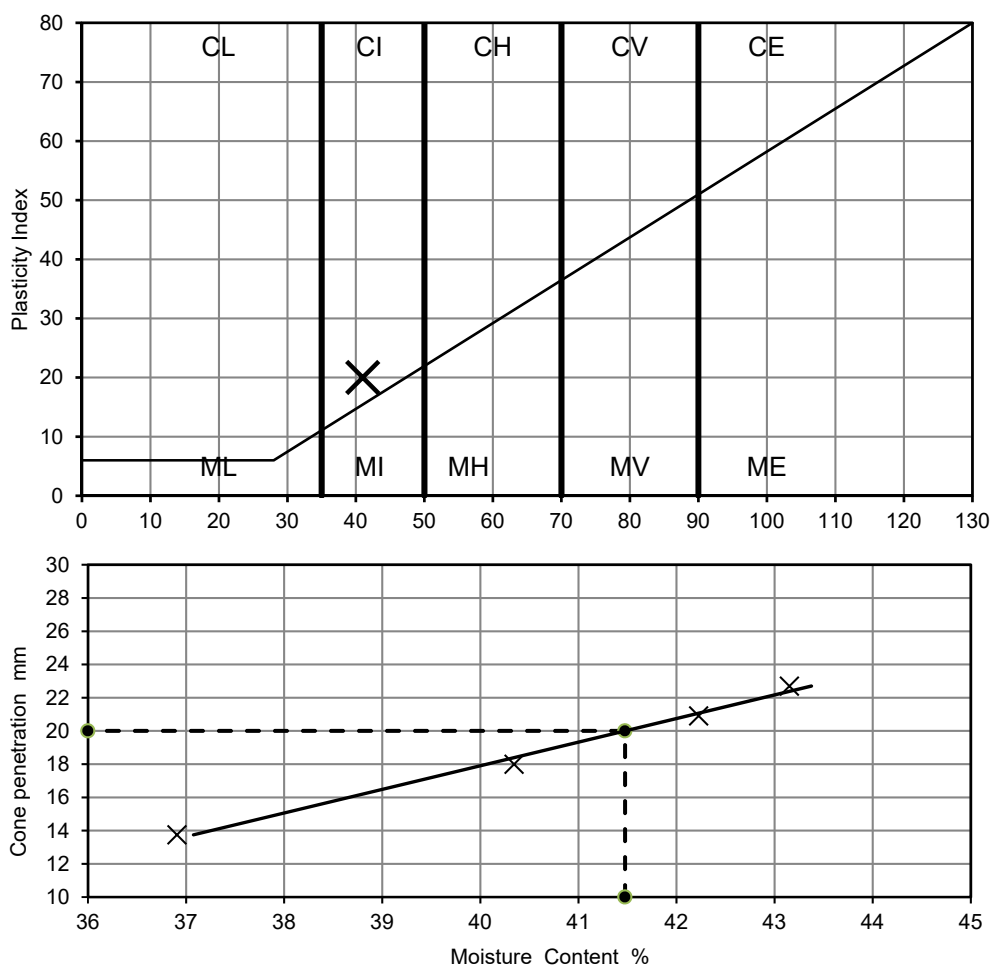


Remarks	Approved	Date	Sheet No.:
	MW M. Willson Laboratory Manager	25/01/2019	1 of 1

LIQUID LIMIT, PLASTIC LIMIT, PLASTICITY INDEX, & LIQUIDITY INDEX

BS 1377 : Part 2 : 1990, clause 4.3 and 5

Project Name:	Drove Lane, Yapton	Project Number:	GL22428A
Client Name:	Trustees of the Langmead Pension Scheme	Sample Location:	WS211
Sample Description:	Brown CLAY	Sample Depth (m)	0.50
		Sample Reference	D2



Preparation: Material was natural

Results: As Received Moisture Content: (BS1377 : Part 2 : Clause 3 : 1990) 24 %
 Percentage Passing 425µm sieve: 100 %
 Liquid Limit: 41 %
 Plastic Limit: 21 %
 Plasticity Index: 20
 Liquidity Index: 0.15
 Modified Plasticity Index: (NHBC Standards Chapter 4.2) 20

Notes:

- 1) Modified Plasticity Index: (NHBC Standards Chapter 4.2) not covered by UKAS accreditation.
- 2) Unless we are notified to the contrary, samples will be disposed after a period of one month from this date.
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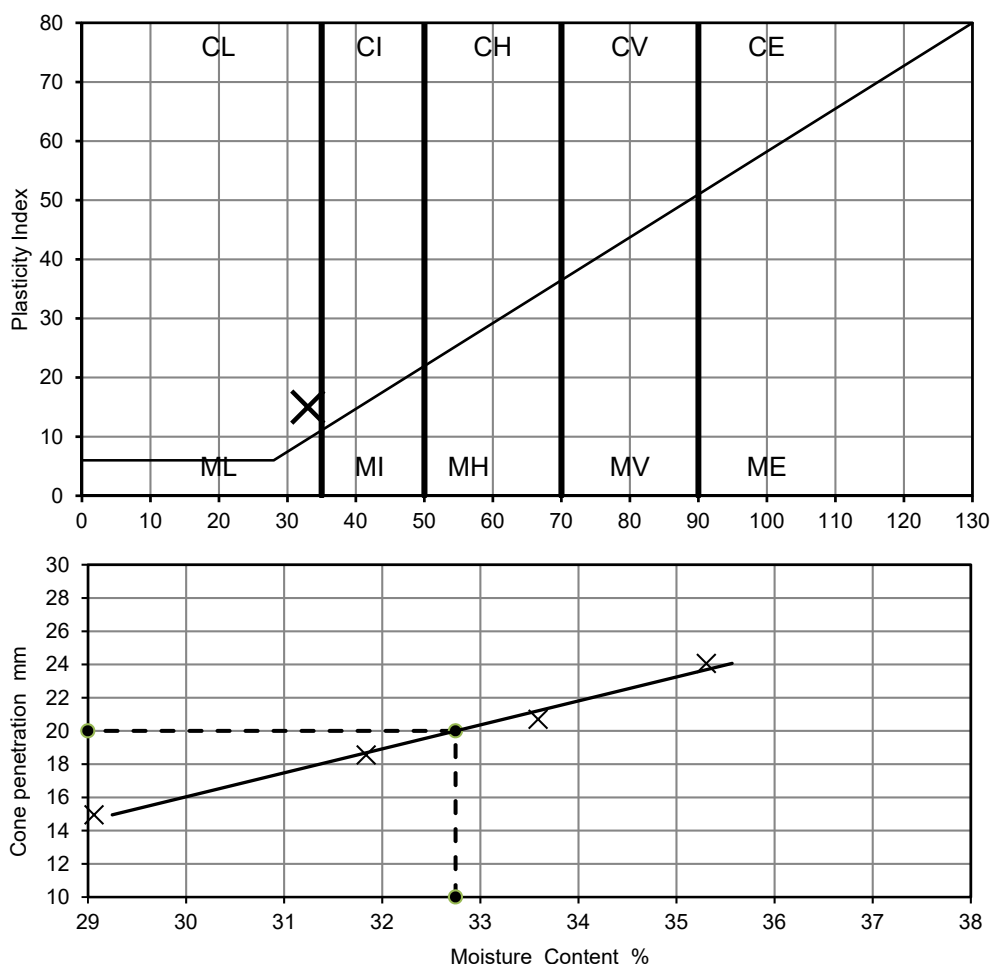


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LIQUID LIMIT, PLASTIC LIMIT, PLASTICITY INDEX, & LIQUIDITY INDEX

BS 1377 : Part 2 : 1990, clause 4.3 and 5

Project Name:	Drove Lane, Yapton	Project Number:	GL22428A
Client Name:	Trustees of the Langmead Pension Scheme	Sample Location:	WS211
Sample Description:	Orange brown , grey brown and brown CLAY	Sample Depth (m)	2.50
		Sample Reference	D6



Preparation: Material was natural

Results: As Received Moisture Content: (BS1377 : Part 2 : Clause 3 : 1990) 22 %
 Percentage Passing 425µm sieve: 100 %
 Liquid Limit: 33 %
 Plastic Limit: 18 %
 Plasticity Index: 15
 Liquidity Index: 0.27
 Modified Plasticity Index: (NHBC Standards Chapter 4.2) 15

Notes:

- 1) Modified Plasticity Index: (NHBC Standards Chapter 4.2) not covered by UKAS accreditation.
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DETERMINATION OF SATURATION MOISTURE CONTENT

BS1377 : Part 2 : 1990 : Clause 3.3

Project Name:	Drove Lane, Yapton	Project Number:
Client Name:	Trustees of the Langmead Pension Scheme	GL22428A

Location	Depth m	Sample Ref	Sample Description	Moisture Content %	Density		Saturation Moisture Content %	Remarks
					Bulk Mg/m3	Dry Mg/m3		
WS203	3.50	D8	Medium density cream stained orange brown and dark brown CHALK.	26	1.97	1.56	27.1	
WS205	4.80	D11	Low density cream CHALK.	23	1.86	1.51	29.0	
WS210	5.00	D11	Medium density cream CHALK.	22	1.91	1.57	26.6	

Notes:

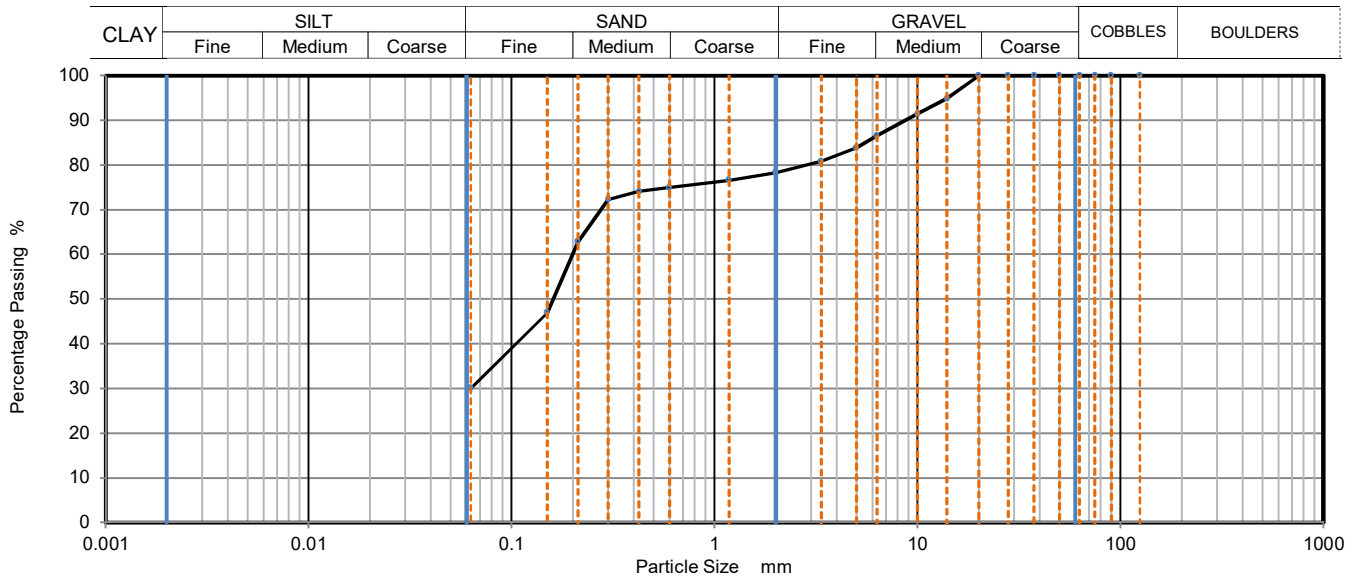
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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

BS1377:Part 2:1990, clause 9.2

Project Name:	Drove Lane, Yapton	Project Number:	GL22428A-01
Client Name:	Trustees of the Langmead Pension Scheme	Sample Location:	WS201
Sample Description:	Light brown very clayey very gravelly SAND. Gravel is of chalk and flint.	Sample Depth (m)	2.50
		Sample Reference	D6



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	95		
10	91		
6.3	87		
5	84		
3.35	81		
2	78		
1.18	77		
0.6	75		
0.425	74		
0.3	72		
0.212	63		
0.15	47		
0.063	30		

Sample Proportions	% dry mass
Very coarse	0
Gravel	22
Sand	48
Fines <0.063mm	30

Grading Analysis		
D100	mm	0.199
D60	mm	
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

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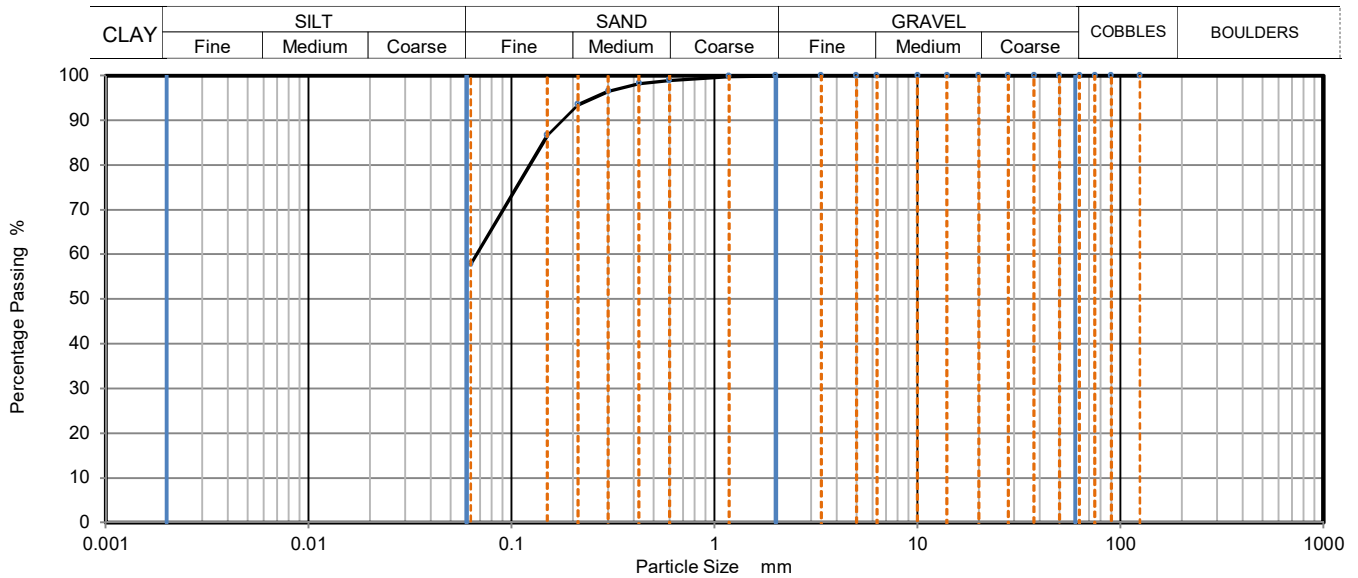


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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

BS1377:Part 2:1990, clause 9.2

Project Name:	Drove Lane, Yapton	Project Number:	GL22428A-01
Client Name:	Trustees of the Langmead Pension Scheme	Sample Location:	WS202
Sample Description:	Grey brown sandy CLAY.	Sample Depth (m)	3.00
		Sample Reference	D7



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	99		
0.425	98		
0.3	97		
0.212	94		
0.15	87		
0.063	58		

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	42
Fines <0.063mm	58

Grading Analysis		
D100	mm	0.067
D60	mm	
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

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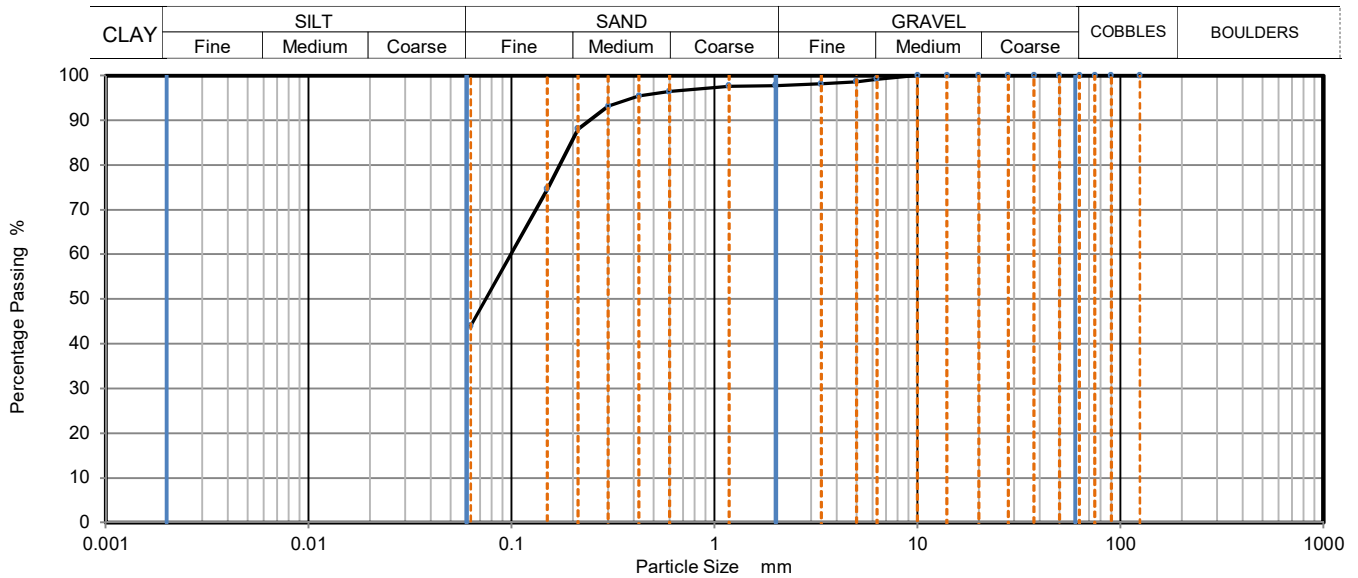


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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

BS1377:Part 2:1990, clause 9.2

Project Name:	Drove Lane, Yapton	Project Number:	GL22428A-01
Client Name:	Trustees of the Langmead Pension Scheme	Sample Location:	WS203
Sample Description:	Brown slightly gravelly sandy CLAY. Gravel is of flint.	Sample Depth (m)	2.00
		Sample Reference	D5



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	99		
5	99		
3.35	98		
2	98		
1.18	98		
0.6	96		
0.425	95		
0.3	93		
0.212	88		
0.15	75		
0.063	44		

Sample Proportions	% dry mass
Very coarse	0
Gravel	2
Sand	54
Fines <0.063mm	44

Grading Analysis		
D100	mm	0.099
D60	mm	
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

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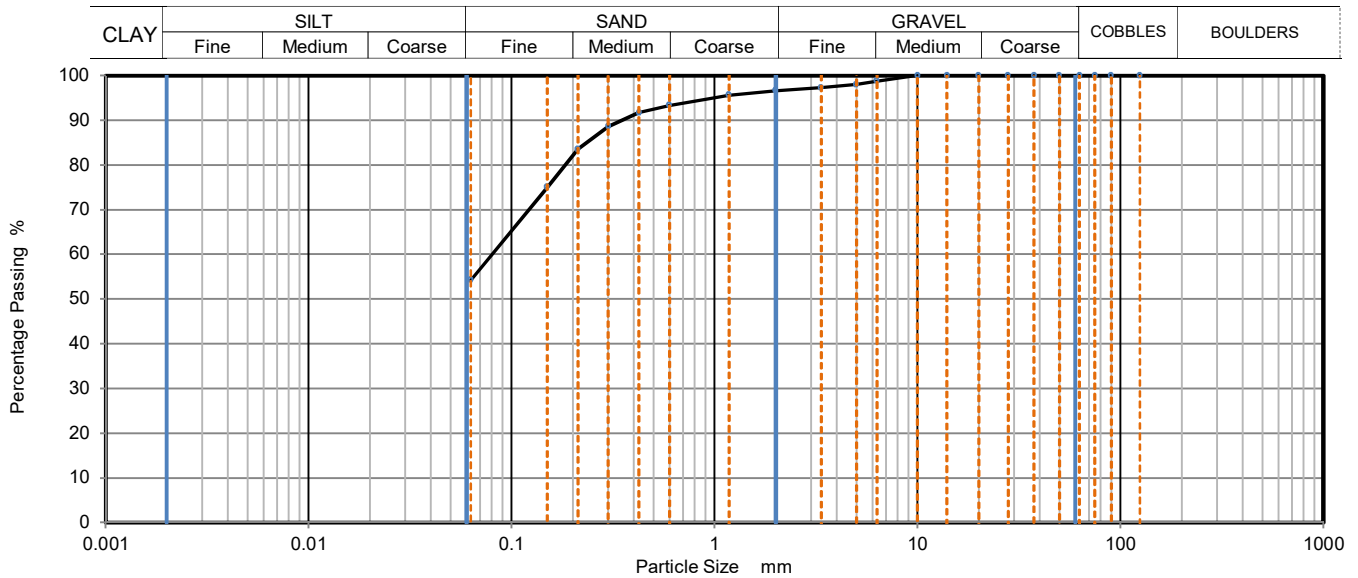


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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

BS1377:Part 2:1990, clause 9.2

Project Name:	Drove Lane, Yapton	Project Number:	GL22428A-01
Client Name:	Trustees of the Langmead Pension Scheme	Sample Location:	WS204
Sample Description:	Orange brown mottled light grey and dark grey slightly gravelly sandy CLAY. Gravel is of flint and chalk.	Sample Depth (m)	2.50
		Sample Reference	D6



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	99		
5	98		
3.35	97		
2	97		
1.18	96		
0.6	93		
0.425	92		
0.3	89		
0.212	84		
0.15	75		
0.063	54		

Sample Proportions	% dry mass
Very coarse	0
Gravel	3
Sand	42
Fines <0.063mm	54

Grading Analysis		
D100	mm	0.080
D60	mm	
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

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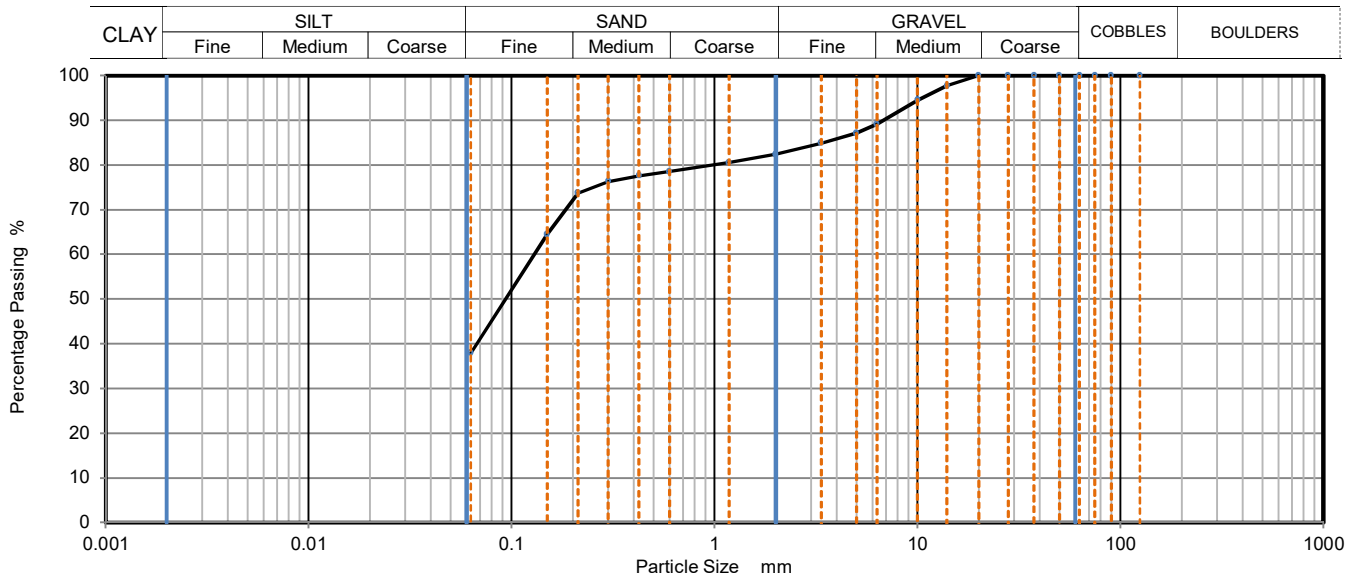


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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

BS1377:Part 2:1990, clause 9.2

Project Name:	Drove Lane, Yapton	Project Number:	GL22428A-01
Client Name:	Trustees of the Langmead Pension Scheme	Sample Location:	WS205
Sample Description:	Light grey brown slightly gravelly sandy CLAY. Gravel is of chalk and flint.	Sample Depth (m)	4.00
		Sample Reference	D9



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	98		
10	95		
6.3	89		
5	87		
3.35	85		
2	82		
1.18	81		
0.6	79		
0.425	78		
0.3	76		
0.212	74		
0.15	65		
0.063	38		

Sample Proportions	% dry mass
Very coarse	0
Gravel	18
Sand	45
Fines <0.063mm	38

Grading Analysis		
D100	mm	0.130
D60	mm	
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

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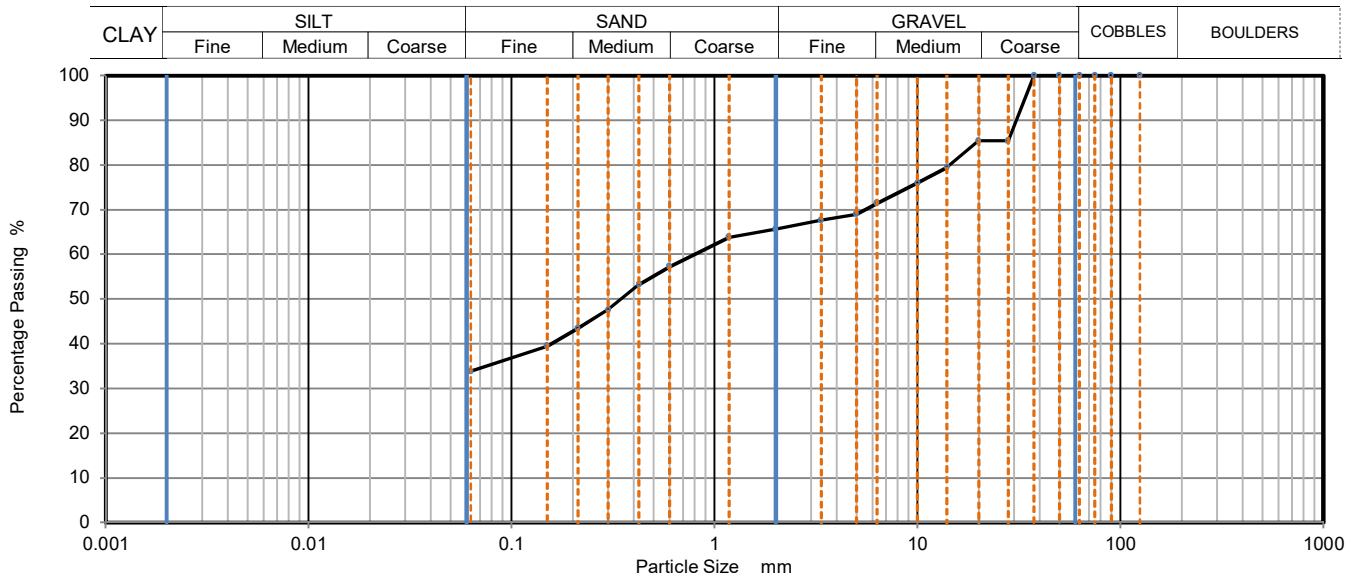


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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

BS1377:Part 2:1990, clause 9.2

Project Name:	Drove Lane, Yapton	Project Number:	GL22428A-01
Client Name:	Trustees of the Langmead Pension Scheme	Sample Location:	WS207
Sample Description:	Brown very clayey SAND / GRAVEL. Gravel is of flint and chalk.	Sample Depth (m)	2.50
		Sample Reference	D6



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	85		
20	85		
14	79		
10	76		
6.3	71		
5	69		
3.35	68		
2	66		
1.18	64		
0.6	57		
0.425	53		
0.3	48		
0.212	43		
0.15	40		
0.063	34		

Sample Proportions	% dry mass
Very coarse	0
Gravel	34
Sand	32
Fines <0.063mm	34

Grading Analysis		
D100	mm	0.799
D60	mm	
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

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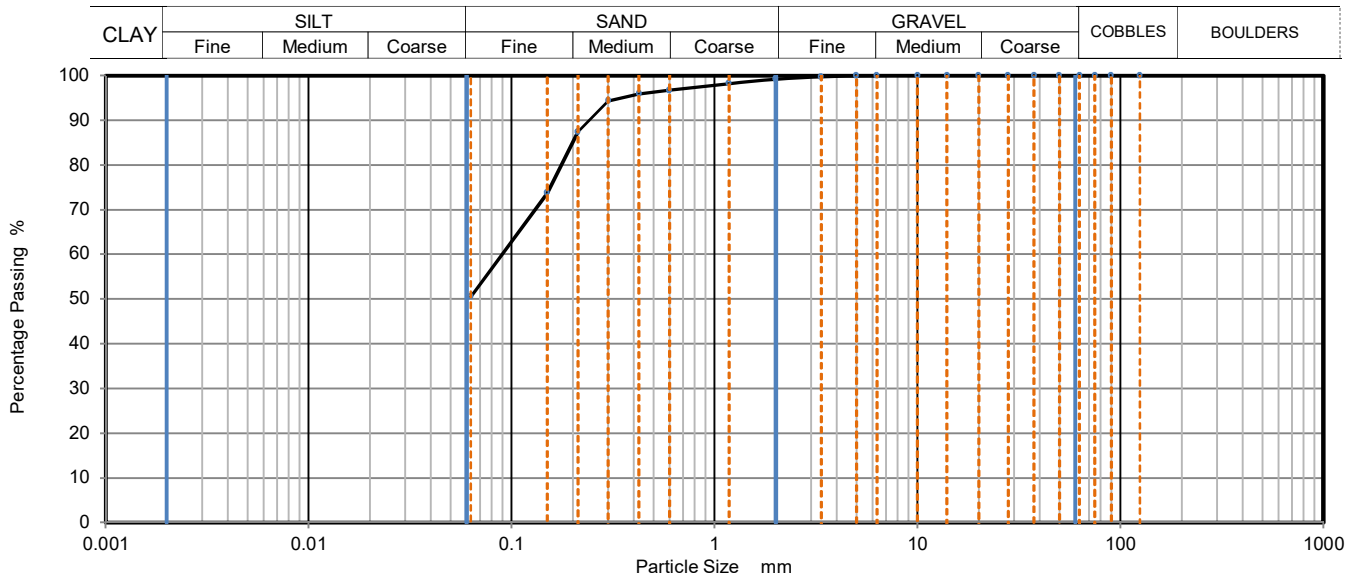


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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

BS1377:Part 2:1990, clause 9.2

Project Name:	Drove Lane, Yapton	Project Number:	GL22428A-01
Client Name:	Trustees of the Langmead Pension Scheme	Sample Location:	WS209
Sample Description:	Orange brown slightly gravelly sandy CLAY. Gravel is of flint.	Sample Depth (m)	1.50
		Sample Reference	D4



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	99		
1.18	98		
0.6	97		
0.425	96		
0.3	94		
0.212	87		
0.15	74		
0.063	51		

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	49
Fines <0.063mm	51

Grading Analysis		
D100	mm	0.090
D60	mm	
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

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Norwich NR6 5DS

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www.harrisongroupuk.com
Email: laboratory@harrisongroupuk.com

Harrison Group Environmental
12, Waterways Business Centre
Navigation Drive
Enfield
EN3 6JJ

For the attention of: Martin Cooper

Page 1 of 1
Issue No: 01

Project: **Drove Lane, Yapton**
Report No: **GL22428A-02**
Your Ref: **GL22428A**

Samples received: 02/04/2019
Instruction received: 02/04/2019
Testing commenced: 03/04/2019

Please find results attached as summarised below.

Item	Description	Quantity	UKAS Accredited
1	Particle Size Distribution - Wet Sieve Method	3	Yes

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Issued by:

Date Issued:



M. Willson

Laboratory Manager

10 April 2019



4031



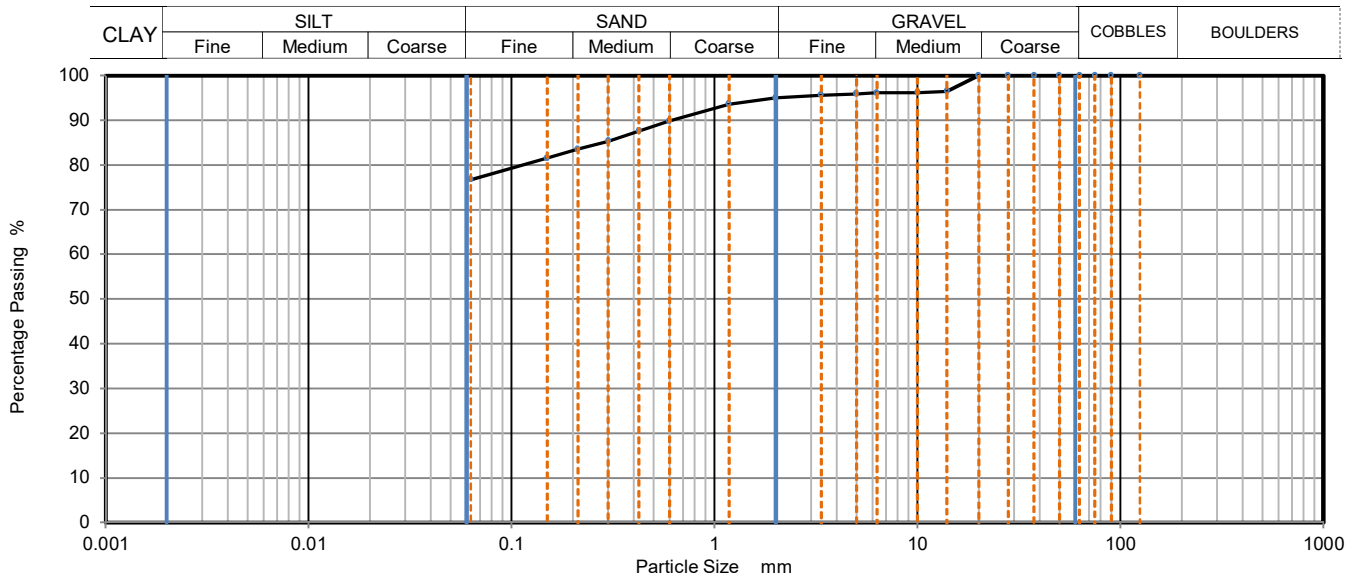
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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

BS1377:Part 2:1990, clause 9.2

Project Name:	Drove Lane, Yapton	Project Number:	GL22428A-02
Client Name:	Trustees of the Langmead Pension Scheme	Sample Location:	PO201
Sample Description:	Brown slightly gravelly slightly sandy silty CLAY. Gravel is of flint	Sample Depth (m)	0.15
		Sample Reference	B1



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	97		
10	96		
6.3	96		
5	96		
3.35	96		
2	95		
1.18	94		
0.6	90		
0.425	88		
0.3	85		
0.212	84		
0.15	82		
0.063	77		

Sample Proportions	% dry mass
Very coarse	0
Gravel	5
Sand	18
Fines <0.063mm	77

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

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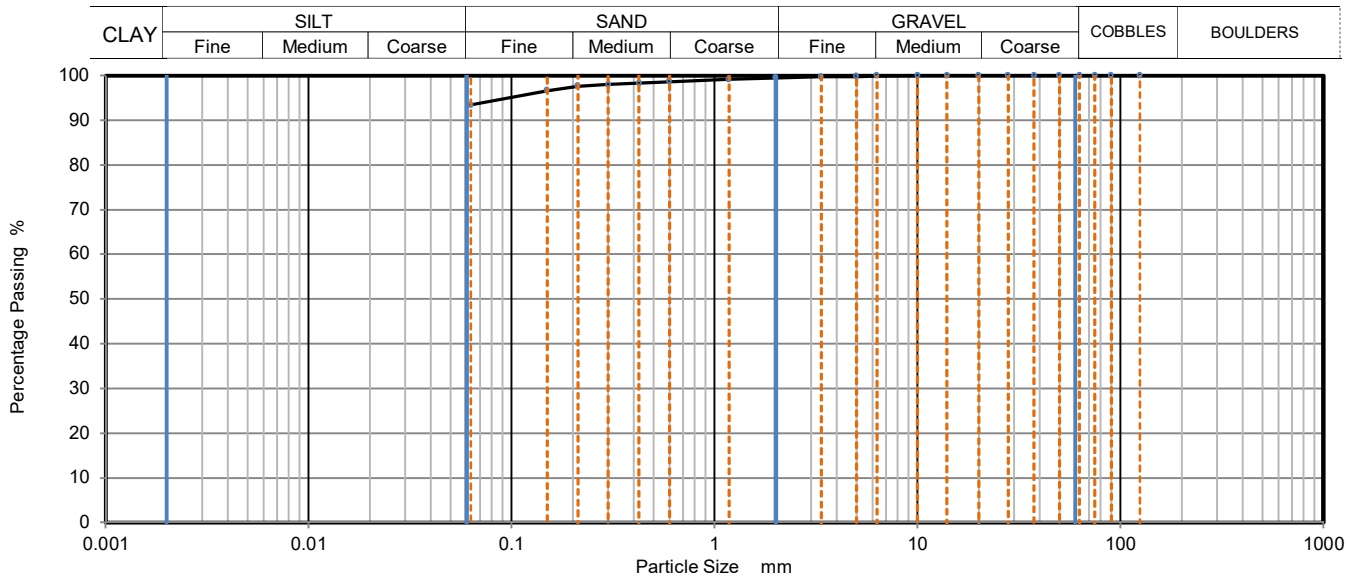


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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

BS1377:Part 2:1990, clause 9.2

Project Name:	Drove Lane, Yapton	Project Number:	GL22428A-02
Client Name:	Trustees of the Langmead Pension Scheme	Sample Location:	PO203
Sample Description:	Brown slightly gravelly slightly sandy silty CLAY. Gravel is of flint	Sample Depth (m)	0.40
		Sample Reference	B1



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	99		
0.6	99		
0.425	98		
0.3	98		
0.212	98		
0.15	97		
0.063	93		

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	6
Fines <0.063mm	93

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

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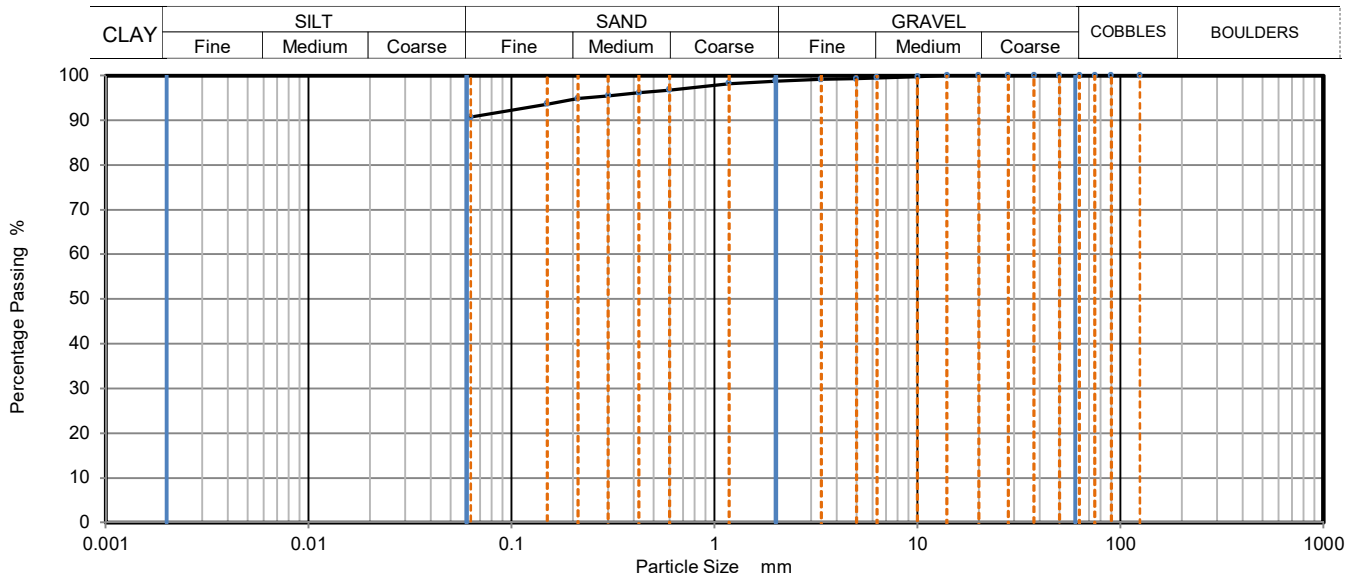


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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

BS1377:Part 2:1990, clause 9.2

Project Name:	Drove Lane, Yapton	Project Number:	GL22428A-02
Client Name:	Trustees of the Langmead Pension Scheme	Sample Location:	PO204
Sample Description:	MADE GROUND (Brown slightly gravelly slightly sandy silty CLAY. Gravel is of flint and occasional brick fragments)	Sample Depth (m)	0.30
		Sample Reference	B1



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	99		
3.35	99		
2	99		
1.18	98		
0.6	97		
0.425	96		
0.3	96		
0.212	95		
0.15	94		
0.063	91		

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	8
Fines <0.063mm	91

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

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**Matthew Wilson**

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e: reception@i2analytical.com

Analytical Report Number : 19-24225

Project / Site name:	Drove Lane, Yapton	Samples received on:	10/01/2019
Your job number:	GL22428A	Samples instructed on:	10/01/2019
Your order number:	PO-32876-GB	Analysis completed by:	16/01/2019
Report Issue Number:	1	Report issued on:	16/01/2019
Samples Analysed:	10 soil samples		

Signed

Jordan Hill
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :	soils	- 4 weeks from reporting
	leachates	- 2 weeks from reporting
	waters	- 2 weeks from reporting
	asbestos	- 6 months from reporting

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Analytical Report Number: 19-24225

Project / Site name: Drove Lane, Yapton

Your Order No: PO-32876-GB

Lab Sample Number				1127418	1127419	1127420	1127421	1127422
Sample Reference				WS201	WS201	WS204	WS204	WS205
Sample Number				B1	D9	D4	D11	D2
Depth (m)				0.50-0.50	4.00-4.00	1.50-1.50	4.70-4.70	0.50-0.50
Date Sampled				07/01/2019	07/01/2019	07/01/2019	07/01/2019	07/01/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	15	16	15	14	16
Total mass of sample received	kg	0.001	NONE	0.22	0.96	0.96	0.24	0.74

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.0	8.7	8.1	8.6	7.8
Total Sulphate as SO ₄	%	0.005	MCERTS	0.026	0.021	0.020	0.044	0.032
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.013	0.0073	0.010	0.014	0.015
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	12.5	7.3	10.1	13.7	14.8
Total Sulphur	%	0.005	MCERTS	0.010	0.006	0.007	0.015	0.012



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Your Order No: PO-32876-GB

Lab Sample Number				1127423	1127424	1127425	1127426	1127427
Sample Reference				WS205	WS210	WS210	WS211	WS211
Sample Number				D10	D3	D7	D3	D6
Depth (m)				4.50-4.50	1.00-1.00	3.00-3.00	1.00-1.00	2.50-2.50
Date Sampled				07/01/2019	07/01/2019	07/01/2019	07/01/2019	07/01/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	10	16	14	17	16
Total mass of sample received	kg	0.001	NONE	0.87	0.22	0.29	0.80	0.21

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.5	7.9	8.6	7.9	8.3
Total Sulphate as SO ₄	%	0.005	MCERTS	0.025	0.023	0.032	0.027	0.022
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.0086	0.014	0.0097	0.012	0.014
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	8.6	13.5	9.7	12.4	14.0
Total Sulphur	%	0.005	MCERTS	0.008	0.011	0.011	0.011	0.008



Analytical Report Number : 19-24225

Project / Site name: Drove Lane, Yapton

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1127418	WS201	B1	0.50-0.50	Brown clay.
1127419	WS201	D9	4.00-4.00	Light brown sand.
1127420	WS204	D4	1.50-1.50	Brown clay with gravel.
1127421	WS204	D11	4.70-4.70	Beige clay with chalk and gravel.
1127422	WS205	D2	0.50-0.50	Brown clay and loam with vegetation.
1127423	WS205	D10	4.50-4.50	Light brown sandy clay with gravel.
1127424	WS210	D3	1.00-1.00	Brown clay.
1127425	WS210	D7	3.00-3.00	Light brown clay and sand with gravel.
1127426	WS211	D3	1.00-1.00	Brown clay.
1127427	WS211	D6	2.50-2.50	Light brown clay.

Analytical Report Number : 19-24225

Project / Site name: Drove Lane, Yapton

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests"	L038	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil	L038	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

APPENDIX E

PERCOLATION TESTING

Location ID	Test Depth/ Soil Type	Elapsed Time		Vp (s/mm)	Equivalent Infiltration Rate (m/s)
		Minutes	Seconds		
PO201	0.20m - 0.50m / Slightly sandy CLAY	01Hrs 31mins 50secs	5510	36.73	9.07E-06
		01Hrs 55mins 16secs	6916	46.11	7.23E-06
		04Hrs 24mins 44secs	15884	105.89	3.13E-06
Average				62.91	6.48E-06

Location ID	Test Depth/ Soil Type	Elapsed Time		Vp (s/mm)	Equivalent Infiltration Rate (m/s)
		Minutes	Seconds		
PO202	0.20m - 0.50m / Slightly sandy CLAY	01Hrs 31mins 50secs	5510	36.73	9.07E-06
		01Hrs 52mins 21secs	6741	44.94	7.42E-06
		02Hrs 08mins 19secs	7699	51.33	6.49E-06
Average				44.33	7.66E-06

Location ID	Test Depth/ Soil Type	Elapsed Time		Vp (s/mm)	Equivalent Infiltration Rate (m/s)
		Minutes	Seconds		
PO203	0.20m - 0.50m / Slightly sandy CLAY	01Hrs 02mins 32secs	3752	25.01	1.33E-05
		01Hrs 31mins 30secs	5490	36.60	9.11E-06
		02Hrs 04mins 50secs	7490	49.93	6.68E-06
Average				37.18	9.70E-06

Location ID	Test Depth/ Soil Type	Elapsed Time		Vp (s/mm)	Equivalent Infiltration Rate (m/s)
		Minutes	Seconds		
PO204	0.20m - 0.50m / Slightly sandy CLAY	00Hrs 27mins 20secs	1640	10.93	3.05E-05
		00Hrs 30mins 40secs	1840	12.27	2.72E-05
		00Hrs 34mins 57secs	2097	13.98	2.38E-05
Average				12.39	2.72E-05

Location ID	Test Depth/ Soil Type	Elapsed Time		Vp (s/mm)	Equivalent Infiltration Rate (m/s)
		Minutes	Seconds		
PO205	0.20m - 0.50m / Slightly sandy CLAY	01Hrs 12mins 43secs	4363	29.09	1.15E-05
		02Hrs 13mins 26secs	8006	53.37	6.25E-06
Average				41.23	8.88E-06

Location ID	Test Depth/ Soil Type	Elapsed Time		Vp (s/mm)	Equivalent Infiltration Rate (m/s)
		Minutes	Seconds		
PO206	0.20m - 0.50m / Slightly sandy CLAY	01Hrs 34mins 10secs	5650	37.67	1.24E-05
		02Hrs 00mins 28secs	7228	48.19	7.82E-06
		03Hrs 20mins 51secs	12051	80.34	4.88E-06
Average				55.40	8.37E-06

Location ID	Test Depth/ Soil Type	Elapsed Time		Vp (s/mm)	Equivalent Infiltration Rate (m/s)
		Minutes	Seconds		
PO207	0.20m - 0.50m / Slightly sandy CLAY	00Hrs 38mins 08secs	2288	15.25	2.19E-05
		00Hrs 43mins 35secs	2615	17.43	1.91E-05
		00Hrs 39mins 12secs	2352	15.68	2.13E-05
Average				16.12	2.08E-05

APPENDIX F

SPT HAMMER CERTIFICATES

SPT Calibration Report

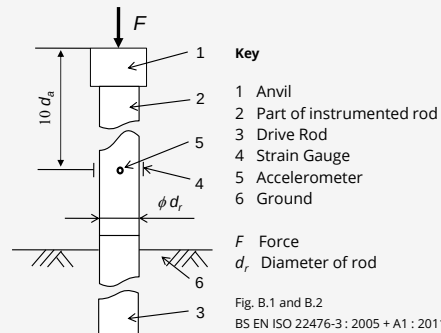
Hammer Energy Measurement Report

Type of Hammer PREMIER
Client GEOTECHNICAL SERVICES
Test No EQU2030

Test Depth (m) 8.70
Mass of hammer $m = 63.5\text{kg}$
Falling height $h = 0.76\text{m}$
 $E_{\text{theor}} = m \times g \times h = 473\text{J}$

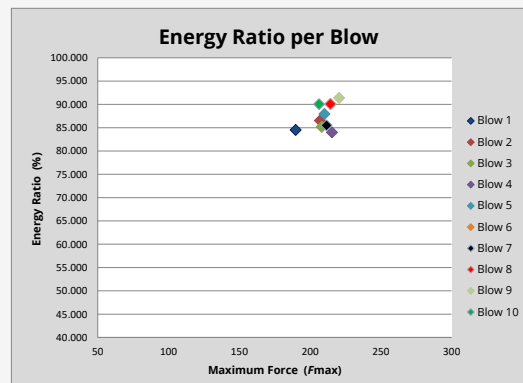
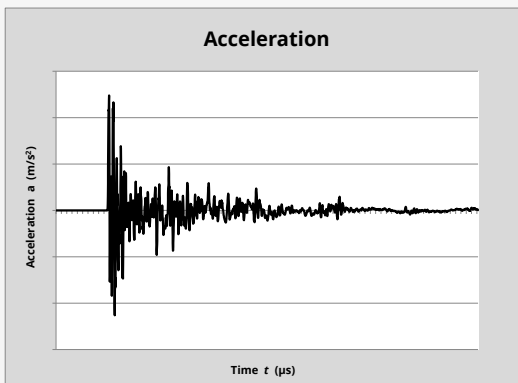
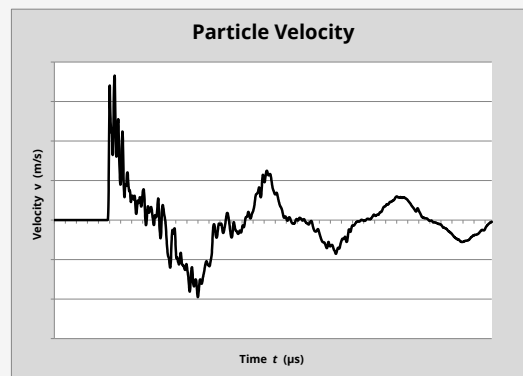
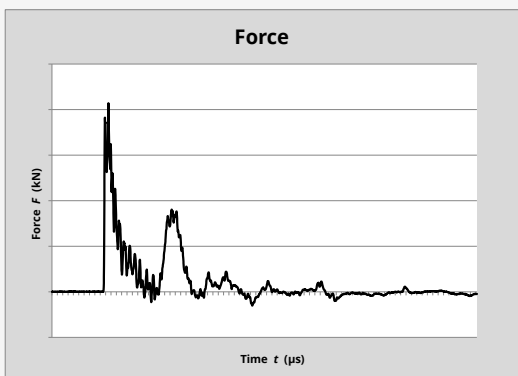
Characteristics of the instrumented rod

Diameter $d_r = 0.052\text{ m}$
Length of instrumented rod 0.558 m
Area $A = 11.61\text{ cm}^2$
Modulus $E_a = 206843\text{ MPa}$



DATE OF TEST **VALID UNTIL** **HAMMER ID**

29/01/2018 29/01/2019 382709



Observations:

1.

$E_{\text{meas}} = 0.415\text{ kN-m}$

$E_{\text{theor}} = 0.473\text{ kN-m}$

Energy Ratio = $\frac{E_{\text{meas}}}{E_{\text{theor}}}$
87.82%
© Copyright 2018

Equipe SPT Analyzer Operators: JML

Prepared by:

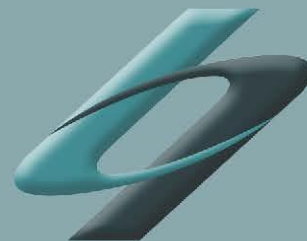
[Signature]

Checked by:

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Date:

01/02/2018



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