



Geo-Environmental

REMEDIATION STRATEGY & VERIFICATION PLAN

for the land at

FORMER DAISYFIELDS CARAVAN PARK

CORNFIELD CLOSE, LITTLEHAMPTON

WEST SUSSEX, BN17 6LD

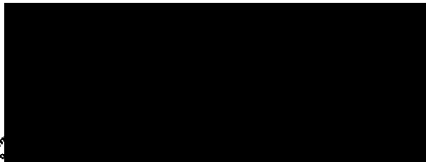
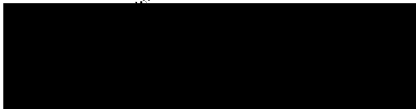
on behalf of

THAKEHAM CLIENT LIMITED





Remediation Strategy & Verification Plan

Report:	REMEDICATION STRATEGY & VERIFICATION PLAN
Site:	FORMER DAISYFIELDS CARAVAN PARK, CORNFIELD CLOSE, LITTLEHAMPTON, WEST SUSSEX, BN17 6LD
Client:	THAKEHAM CLIENT LIMITED
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**AMENDMENT RECORD**

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1.0 INTRODUCTION

1.1 General

Following a Phase I and Phase II assessment of the site, detailed within reports listed below, Geo-Environmental was appointed by Thakeham Client Limited, to formulate a Remediation Strategy in relation to the proposed development at Former Daisyfields Caravan Park, Cornfield Close, Littlehampton, herein referred to as 'the site' (Figures 1 and 2).

Geo-Environmental was commissioned in November and December 2017 to undertake a standalone desk study (ref: **GE16903-DSR-DEC17**) and subsequent baseline ground investigation (ref: **GE16903BGIR-JAN18**) for the above mentioned site. An additional final phase of intrusive investigation was also commissioned in 2018 (ref **GE17106 - GAR/AP01/231018**) to support development of both the construction and remedial strategy and the findings are incorporated herein.

The remedial strategy presented herein has been developed to reflect the findings from all phases of the assessments undertaken on this site. Based on the findings of the investigations it is considered that remediation works would be required with respect to soil and ground gas contamination identified within the Made Ground.

1.2 Objectives

The Remediation Strategy & Verification Plan (RSVP) sets out the proposed remedial works to be undertaken on the subject site to support its development for a proposed residential end use with both private gardens and public open spaces.



2.0 BACKGROUND

This Remediation Strategy & Verification Plan (RSVP) has been developed from the findings of the various phases of assessment.

A brief overview of salient findings of the reports is presented below. For further information, the individual reports should be referred to directly.

2.1 Overview

The site comprised a generally flat and level grass covered former caravan and camp site. Through the process of completing the desk study and intrusive investigation, it was discovered that the majority of the site comprised an infilled former brick quarry.

In general, the ground conditions encountered can be summarised as follows:-

Beneath the turf, hardstanding or capping material Made Ground comprising landfilled material was encountered within all locations to depths of between 1.70m and 2.90m bgl and was of a mixed composition comprising sandy clay and silty sand with brick, glass, plastics, metal, china, ash, coal, concrete, black organic matter, shoes, fabric, timber, and flint gravel.

Underlying the Made Ground, River Terrace Deposits were encountered within all locations with the exception of TP207 to depths of between 2.0m and 7.0m bgl and generally comprised medium dense orange brown sandy clay becoming orange brown sand with flint gravel with slight traces of chalk at depth. Organic malodours were noted within BH105 only, at a depth of between 6.50m and 7.00m bgl. TP207 was advanced within the Made Ground only and was terminated prematurely at a depth of 2.2mbgl.

Underlying the River Terrace Deposits, the Lewes Nodular Chalk was encountered within the cable percussion boreholes to depths of between 10.00m and 15.00m bgl (maximum depth of the investigation) and was generally recovered as structureless CHALK composed of sub-angular to rounded gravel. Clasts are weak, medium, high and very high density, off-white within an off-white matrix. For further details of the ground conditions encountered, reference should be made to the information presented in Appendix A, which includes four sections across the site.

2.2 Proposed Site Use

The proposed development is to consist of 77 residential units with private gardens, soft landscaping, amenity space, parking, roadways and associated infrastructure.

2.3 Conceptual Site model

Assessment of the investigation findings have identified particular hazards, or potential hazards which were considered to require intervention (remediation) to mitigate the risk of harm. Remediation works are proposed to break the identified plausible pollutant linkages associated with ground gases and in respect to soil contamination.

This would be undertaken as several phases of works on site:

- 1) Installation of a soil cover system in private garden areas and areas of soft landscaping to break the pollutant linkage for the contaminants identified within the Made Ground soils and to also provide



suitable growing media. The cover system shall incorporate a 150mm thick break layer formed of stone or crushed concrete with a geotextile membrane laid above and beneath, and overlain by a layer of geofabric to act as a visible deterrent overlain by a minimum 300mm thickness of subsoil and a minimum of 150mm of Topsoil.

- 2) It may be possible to re-use the impacted Made Ground on site where deemed suitable (geotechnically and geochemically without treatment) beneath proposed building footprints and areas of hardstanding in line with a Materials Management Plan (MMP), subject to the appropriate documentation, Definition of Waste Code of Practice (DoWCoP) assessment, Qualified Person (QP as defined in DoWCoP) declaration and agreement of the Regulators.
- 3) Installation of gas protection measures, within proposed properties in line with a CIRIA/BS8485 CS2 classification, to protect against elevated concentrations of methane and carbon dioxide identified.

The aim of the remediation is not to remove all contamination identified on site but to reduce the identified risk to an acceptable level with respect to human health, the built environment and controlled waters.



3.0 GROUND GAS

The ground investigation works identified the presence of a thickness of Made Ground/infilled ground on the site associated with the former landfill identified on the site. The Made Ground within the former landfilled area was found to comprise a thin capping layer of clayey sandy silt and silty sandy clay with brick and concrete fragments, with a mixture of brick, glass, plastics, metal, china, ash, coal, concrete, black organic matter, shoes, fabric, timber, and flint gravel below. This fill material was encountered to depths of between 1.70m and 2.90m bgl. Information reviewed as part of the desk study indicated that the waste body did not benefit from any in-ground engineering or barriers and thus would presumably be a 'dilute and disperse' type body.

As such a period of gas monitoring was recommended, this was to comprise a combination of continuous and 'spot' ground gas monitoring. As part of the intrusive investigation works completed by Geo-Environmental, standpipes were installed on site and ground gas monitoring was undertaken to assess the potential risk posed to end users of the proposed development.

Spot Monitoring

The spot monitoring undertaken to date has detected methane at concentrations in the range 0-8.5%, carbon dioxide in the range 0-19.4%, and oxygen in the range 0-19.4%. VOCs have been detected up to 3.2ppm. Borehole gas flow was detected within two of the monitoring standpipes, BH101d and BH102s and ranged from 0.9 to 3.0l/hr. Atmospheric pressure was recorded as being between 1014-1017mb during the visit undertaken to date.

Continuous Monitoring

Continuous ground gas monitoring was undertaken within ten gas monitoring standpipes, BH101 through to BH110, for a period of 3 weeks from 26th September 2018 to 17th October 2018, with the locations being sited within the former landfill area. This monitoring was undertaken during the winter months to try and target periods of low and/or falling pressures to target a worst case scenario. The continuous ground gas monitors utilised were Ambisense monitors which provided continuous data relating to both gas concentration and gas flow rates.

Ambisense continuous ground gas monitors were installed within boreholes, BH101-BH110 on the 26th September 2018, to provide coverage of the landfill gas source as well as to target likely gas migration pathways. The location of these continuous monitoring points are shown in Figure 2. The continuous monitors were set up to record gas concentrations (methane, carbon dioxide, oxygen, carbon monoxide, hydrogen sulphide and in selected locations VOC's), gas flows (peak and steady state), along with atmospheric pressure at hourly intervals over a 3 week period.

Table 1 below summarises the minimum and maximum gas concentrations encountered during the monitoring period.

Location	Methane (% v/v)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		Carbon Monoxide (ppm)		Hydrogen Sulphide (ppm)		VOC (ppm)	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
BH101	0	6.53	7.22	25.2	0.06	17.6	0	5.99	0	0.1	-	-
BH102	0	2.43	6.37	20.04	1.73	15.58	1.57	19.43	0.3	3.89	0	1.7
BH103	0	0	1.22	11	7.86	14.93	0	1.73	0	0.05	-	-
BH104	0	0.02	0.57	5.7	13.7	17.87	0.01	1.53	0	0.07	-	-
BH105	0.02	0.95	5.05	15.89	4.33	17.63	0.65	13.48	0.06	2.93	0	1.55
BH106	0.01	0.1	0.52	8.36	12.5	18.53	0	0.86	0	0	-	-



Location	Methane (% v/v)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		Carbon Monoxide (ppm)		Hydrogen Sulphide (ppm)		VOC (ppm)	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
BH107	0.01	0.35	1.41	6.17	14.7	18.48	0.02	6.63	0.03	0.76	0	0
BH108	0	0.8	4.38	10.07	11.8	16.54	0.69	8.9	0.06	3.37	0	0
BH109	0	0.03	0.96	11.73	3.62	16.23	0.21	1.83	0	0	-	-
BH110	0	0.18	3.23	20.55	3.02	18.53	1.02	5.56	0	2.35	0	1.33

Table 1 Summary of minimum and maximum gas concentrations through continuous monitoring

Table 2 below summarises the gas flow rates encountered during the monitoring period.

Location	Peak Flow (l/hr)		Steady State Flow (l/hr)	
	Min	Max	Min	Max
BH101	0	0.56	-0.11	0.03
BH102	0	0.63	-0.15	0.05
BH103	0	0.34	-0.06	0.01
BH104	0	1.19	-0.12	0.08
BH105	0	0.36	-0.1	-0.02
BH106	0	0.97	-0.06	0.24
BH107	0	0.51	-0.06	0.05
BH108	0	1.24	-0.09	0.19
BH109	0	0.29	-0.07	0.05
BH110	0	0.97	-0.15	0.33

Table 2 Summary of minimum and maximum flow rates through continuous monitoring

The continuous gas monitoring was undertaken during periods of low and falling pressure in order to target a worst case scenario. The continuous monitoring identified gas concentrations for methane in the range 0%-6.53%, carbon dioxide in the range 0.52%-25.2% and oxygen in the range 0.06%-18.53%. Carbon monoxide was detected in the range 0-19.43ppm, hydrogen sulphide in the range 0-3.89ppm and VOC's in the range 0-1.7ppm.

Positive gas flow rates, and marginally negative gas flow rates were identified within all of the monitoring locations during the continuous monitoring. A maximum flow rate of 1.24l/hr was detected within BH108.

A review of the occurrences of the peak concentrations of gas recorded during the continuous monitoring period has shown that these occurrences, in general, coincided with periods of low or falling atmospheric pressure.

Ground Gas Risk Assessment

A Tier 1 Ground Gas Risk Assessment (GGRA) incorporating the results of the desk study and ground investigation has been undertaken as part of this assessment.

Recommendations on acceptable gas concentrations recorded in the ground beneath or adjacent to buildings are given in a variety of publications. For the purpose of this assessment, the results have been evaluated in terms of British Standard BS8485, 'Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings' (2015); CIRIA C665, 'Assessing risks posed by hazardous ground gases to buildings' (2007) and NHBC report 10627-R01(04) 'Guidance on evaluation of development proposals where methane and carbon dioxide are present' (2007).



Gas screening values (GSV) have been calculated for both methane and carbon dioxide in accordance with the recommendations contained within C665. The highest reported positive gas flow rate was recorded during the spot monitoring, 3.0l/hr. The worst case, i.e. the highest concentration value, of recorded methane and carbon dioxide have been used. Therefore a value of 8.5% v/v has been utilised for methane and a value of 25.2% v/v has been used for carbon dioxide.

Using these worst case values a GSV of 0.255 has been calculated for methane and a GSV of 0.756 has been calculated for carbon dioxide. This would classify the site as representative of Characteristic Situation 3 (BS and CIRIA) and Amber 2 (NHBC), across the site. The site only just falls within the classification for Characteristic Situation 3 based on the GSV calculated for carbon dioxide being greater than 0.7.

The GSV's have been calculated using the worst case results collected from both the 'spot' and the continuous monitoring undertaken, and are therefore considered to be conservative. If the results of the continuous monitoring are treated in isolation then a GSV for carbon dioxide calculated based on the maximum concentration (25.2%), and the highest flow rate (1.24l/hr) recorded during this monitoring period would be 0.312 for carbon dioxide.

This initial assessment has been feed back into the conceptual site model. An onsite source of ground gas has been established, a former landfill site, and residential development is proposed across the site. The ground conditions encountered on site comprise a combination of clays, sands and gravels. These ground conditions do not represent continuous migration pathways although they will contain isolated migration pathways for ground gases. The Made Ground encountered during the intrusive investigation works comprised clayey sandy silt and silty sandy clay with brick and concrete fragments, with a mix of brick, glass, plastics, metal, china, ash, coal, concrete, black organic matter, shoes, fabric, timber, and flint gravel below. This type of material has a limited gassing potential and given the likely age of the landfill the gassing potential of this material will be reduced further.

Given the above assessment it is therefore considered representative of the sites gassing conditions to utilise the GSV calculated for carbon dioxide solely from the continuous gas monitoring, therefore classifying the site as Characteristic Situation 2 and Amber 2.

Ground Gas vs. Human Health

Based on the above assessment and the gas monitoring undertaken it is considered that the site's gassing regime, based on both hazardous gas flow and limiting concentrations, to be representative of Characteristic Situation 2 (BS and CIRIA) across the site. It was not deemed suitable to zone the site due to the fluctuations in recorded gas concentrations, gas flows and the variable nature of the underlying ground conditions. It is therefore recommended that gas protection measures are installed within all properties across the site in line with CIRIA CS2 in accordance with BS8485.

In accordance with BS8485, the proposed residential development is considered to comprise a Type A buildings (residential) and thus, with a gassing regime of CS2, any gas protection measures installed within the proposed buildings are required to achieve a cumulative score of at least 3.5 (Table 4 BS8485:2015).

As such and in accordance with BS8485 and CIRIA C665 the following gas protection measures, or a combination of a selection of the following gas protection measures will be required to be installed within all buildings of the proposed development:



- Reinforced concrete cast in situ floor slab (suspended, non-suspended or raft) with at least 1200g DPM and sufficient reinforcement to mitigate/control cracking and minimal services penetrations through (and sealed to) the slab. (BS8485 gives this a score of 1.0-1.5 depending on reinforcement and services penetration. The 1200g DPM is likely to have a score of zero);
or
- Beam and block or pre-cast concrete slab and minimum 2000g DPM/reinforced gas membrane (BS8485 gives this a score of 0 [zero] for the slab and 2 for a reinforced gas membrane);
- Possibly underfloor venting with either of the above floor construction types depending on use (BS8485 score of 0.5-1.5 is likely);
- Passive floor dispersal layer (good performance – BS8485 score 1.5), utilising any of the following media to provide the dispersal layer:
 - Clear void
 - Polystyrene void former blanket
 - Geocomposite void former blanket
 - No fines gravel layer with gas drains
 - No fines gravel layer
- or
- Suitable gas resistant (methane and carbon dioxide) membrane meeting the following criteria for a BS8485 score of 2:
 - sufficiently impervious to the gases with a methane gas transmission rate <40.0 ml/day/m²/atm (average) for sheet and joints (tested in accordance with BS ISO 15105-1 manometric method)
 - sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas emissions
 - sufficiently strong to withstand in-service stresses (e.g. settlement if placed below a floor slab)
 - sufficiently strong to withstand the installation process and following trades until covered (e.g. penetration from steel fibres in fibre reinforced concrete, penetration of reinforcement ties, tearing due to working above it, dropping tools, etc)
 - capable, after installation, of providing a complete barrier to the entry of the relevant gas
 - verified in accordance with CIRIA C735

Based on current development proposals it is yet to be decided as to whether a ventilated sub-floor void will be incorporated within the final construction. As such two floor construction options are set out below. Option 1 sets out the requirements based on a reinforced concrete floor slab construction and Option 2 sets out the requirements based on a ventilated floor construction. Both options demonstrate how the required cumulative score can be met in order to comply with CS2 and a Type A building.

Option 1 – Reinforced concrete floor slab

The floor construction will comprise a reinforced cast in-situ floor slab where service penetrations are reduced to a minimum and where possible are not brought through the floor slab. The floor slab will comprise sufficient reinforcement to mitigate/control cracking within the floor. This floor construction would achieve a score of **1.5** points.

In addition a suitable gas resistant membrane meeting the criteria listed within BS8485 will also be installed within the floor. The membrane must be resistant to methane and carbon dioxide (and compliant with BS8485), suitably installed and independently validated. It should be noted that membranes made from recycled plastics are not acceptable as gas protection membranes and the installer must check to confirm that the membrane is not made from recycled plastics. Installation of a gas resistant membrane will give a score of **2** points.



Installation of a reinforced floor slab and suitable gas resistant membrane would achieve a cumulative score of **3.5** points and therefore complying with the requirements of BS8485 for a CS2 classification for Type A buildings.

Option 2 – Ventilated Floor Slab

The floor construction will comprise a pre-cast concrete slab, this floor construction will achieve a score of **0** points. Underfloor venting will be incorporated within the floor construction, comprising a clear void and therefore achieving a score of **1.5** points.

In addition a suitable gas resistant membrane meeting the criteria listed within BS8485 will also be installed within the floor. The membrane must be resistant to methane and carbon dioxide (and compliant with BS8485), suitably installed and independently validated. It should be noted that membranes made from recycled plastics are not acceptable as gas protection membranes and the installer must check to confirm that the membrane is not made from recycled plastics. Installation of a gas resistant membrane will give a score of **2** points.

Installation of a pre-cast concrete slab with a clear void underfloor venting layer and suitable gas resistant membrane would achieve a cumulative score of **3.5** points and therefore complying with the requirements of BS8485 for a CS2 classification for Type A buildings.

The specific details of the specification of the gas protection measures installed will be provided within the Validation Report for the site. Validation of gas protection measures will be undertaken by the Environmental Consultant or other appropriate independent party. Inspection of the protection measures will include key stages of the build process for the proposed structures and will include photographic evidence of installation.



4.0 SOILS

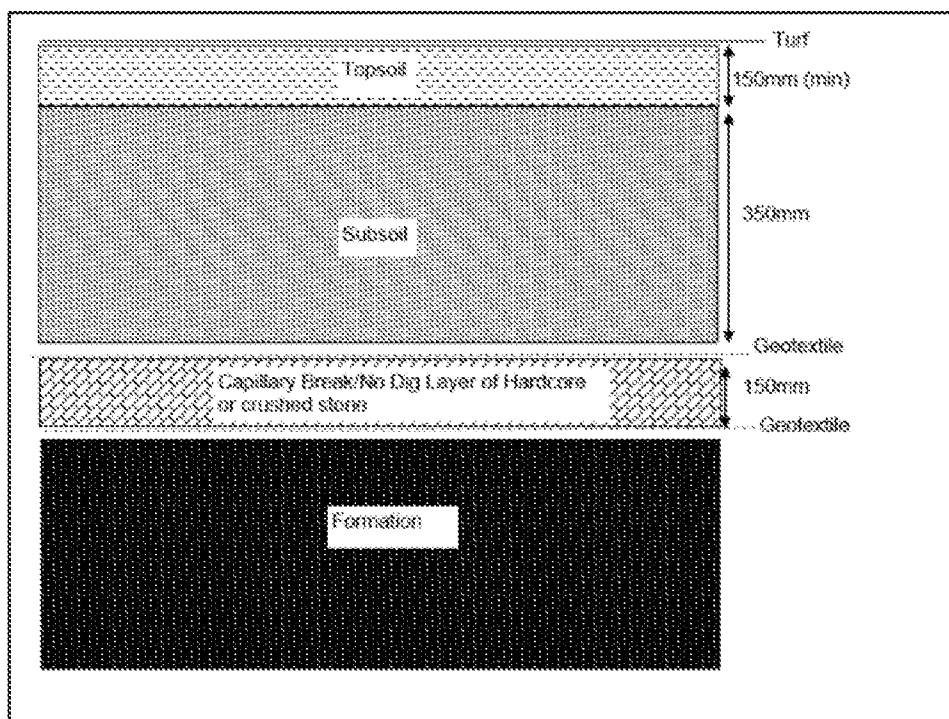
The ground conditions within the former caravan park have been established through several phases of intrusive investigation.

With reference to report **GE17106 - GAR/AP01/231018**, through a process of statistical analyses on the results of chemical analyses on both deeper and near surface soil samples, it was considered that the near surface soils have been impacted by Lead, Arsenic, PCBs, SVOCs, VOCs and ACMs and remedial measures were deemed necessary to protect end users of the proposed properties from soil contamination within private garden and soft landscaped areas. Furthermore, the physical quality of all near surface soils was deemed unsuitable for inclusion in private gardens due to the presence of concrete, brick, and tarmacadam. In addition ACMs and asbestos fibres have been identified both visually and within chemical analysis to be present within the Made Ground.

4.1 Remedial Recommendations – End Users

Based on the proposed layout, all houses were to include private gardens whilst apartments were to include communal gardens. Soft landscaping around the development was also proposed.

In areas remote from those designated for tree root protection it is recommended that the Made Ground beneath be removed or the site raised to a depth of 650mm and be replaced with chemically and geotechnically suitable material with a high visibility marker geotextile layer such as Terram High-Vis placed at the base between the imported soils and a capillary break layer comprising crushed stone or hardcore of 150mm and underlain by a further layer of Terram. An indicative diagram of the cover system construction is shown below:-



In areas designated for tree root protection, i.e under the existing tree canopies, the Topsoil should be removed carefully by the use of hand tools to a depth of 150mm and replaced with clean certified imported Topsoil.



Any imported Topsoil or Subsoil should be of suitable chemical and physical quality for the proposed end use. Certification for both sub-soil and Topsoil should include laboratory analysis for determinands known to pose a risk to human health (i.e. heavy metals, poly-aromatic hydrocarbons [PAHs], total petroleum hydrocarbons [TPH] and asbestos) as well as broadly meeting the requirements of BS3882:2015 (Topsoil).

As a matter of good practice, it is recommended that the location, approximate extent and thickness of any imported topsoil are recorded and presented in the Validation/Verification Report to be prepared by the Environmental Consultant. Soil importation criteria is detailed in Appendix B.

In the event of dry spells, or where the exposed surface becomes dry, regular damping down of the surface of the site will be required to prevent the release of soil dust which could impact on site operatives or migrate off-site, thereby mitigating both off-site exposure and nuisance for neighbours.

Where soils are proposed to be located beneath building footprints or hard standing, the plausible pollutant linkage for direct contact is removed and thus risk of harm to end users from exposure to the contaminants is removed, as roads, buildings and permanent hard cover would sever the pollutant linkage and thus the impacted shallow soils could remain in these areas.

Any soils imported onto the site should be verified free from contamination with chemical testing undertaken to confirm their suitability for use within areas of soft landscaping.

Should any regrading works be required on site which propose re-use materials (to include Made Ground) on the site of origin a Materials Management Plan will be developed for the site under the Code of Practice where:

- 1.) They are suitable for use at the location in question (without prior treatment)
- 2.) They won't cause unacceptable risks to people or the environment
- 3.) They are used in the right quantities
- 4.) There is certainty of use

As such excavated soils on site will be removed from site for disposal, treatment at an appropriately licensed facility or re-used under the CL:AIRE Definition of Waste, Code of Practice where it can be demonstrated that there is a need for the use of the materials and where the risk is demonstrated to be acceptable under a Materials Management Plan.

Where contaminated soils are located in an area of permanent hard cover, e.g. building footprint, road, driveway or the like, then the hard cover would break the pollutant linkage and remediation would not be required in terms of the risk to human health, however limited works may be required in these areas to provide a suitable working platform for development to proceed.

4.2 Site Workers

It is the responsibility of the Principal Contractor and their appointed sub-contractors to implement and manage safe systems of work, prepare their own risk assessments in accordance with Health and Safety legislation in order to protect persons in their employ, as well as mitigate the risk of harm to others due to works in their control. Special consideration should be given to the provisions of the Construction (Design & Management) Regulations 2015, Health and Safety at Work Act and the Control of Substances Hazardous to Human Health regulations to protect the safety of persons in their employment. Additional guidance can be sought from the CIRIA publications entitled "A Guide for Safe Working on Contaminated Sites" and "Environmental Good Practice on site guide (fourth edition)".



In addition to the safe systems of works to be implemented alongside appropriate risk assessments and method statements, all site personnel shall benefit from on-site hygiene facilities including wash area, toilets and drying room. Separate canteen area and welfare facilities should be provided. All eating and drinking should be restricted to the canteen area and only once site personnel have removed outer PPE and washed exposed skin.

4.3 Inspection/Validation

Verification of remediation measures shall be required through regular inspection at key stages of the works to include:

- The removal of Made Ground, placement of a cover system, including verification of any additional subsoil and/or Topsoil in order to allow for the installation of the capping system required in private gardens and areas managed soft landscaping areas.
- Inspection and verification of gas protection and gas mitigation measures at key stages of construction.

It is likely that verification will be undertaken in stages, such as site preparation, reduced dig, subsoil placement and topsoil placement. As such, final verification of the completed cover system is likely to be at the end of construction.

Details of these works would be presented within a verification report for the site, to include the requirements of the Code of Practice should materials be proposed to be re-used under the Definition of Waste Code of Practice.

4.4 Built Environment

Buried plastics laid in contact with contaminated soils may be susceptible to attack by aggressive chemicals; therefore, potable water supplies may potentially become contaminated or tainted. Whilst the upper 650mm of impacted materials will be removed from garden and communal soft landscape areas, water supply pipes are likely to be installed within Made Ground soils.

The use of barrier pipe possibly with cast iron connections is likely to be required for potable water supplies through the site.

The utility company should be consulted in order to confirm their specific requirements in this respect. Potable supply pipe installation should be confirmed and verified through inspection during construction.

As a matter of good practice and to maximise the protection to maintenance workers, clean, granular backfill should be used in service runs and marker tapes for all buried services. This would not mitigate the requirement for the water supply pipe.



5.0 WASTE

5.1 Waste Classification and Segregation

Waste may be defined as any substance or object in Annex 1 of the Waste Framework Directive which the holder discards, intends to discard, or is required to discard. The holder of waste is anyone in possession of waste or generates it and therefore both the contractor and ultimately the developer are responsible for safe disposal of waste.

The following information is provided for preliminary guidance purposes, as different facilities or operators may have differing acceptance criteria and Waste Acceptance Criteria (WAC) analysis may be required to confirm the exact classification. In addition, if the intention is retain excess spoil/arising on site for specific purposes, then these soils would not comprise waste, although this is subject to confirmation and relevant declaration under the Definition of Waste Code of Practice.

In the first instance forty-four laboratory results were uploaded to Atkins' waste soils characterisation assessment tool, 'CatWasteSoil' which determines whether a generated waste has any hazardous chemical properties based on standard laboratory analysis. The results for the analysed determinands did not exceed the relevant CatWasteSoil Hazard Class thresholds in thirty-seven of the forty four samples. Seven samples were identified with hazardous properties due to high zinc concentrations (ecotoxic). These are summarised in Table 3 below.

Location	Depth (m)	Hazardous Properties
TP4	1.00	Yes
TP205	2.00	Yes
TP206	1.50	Yes
TP209	1.50	Yes
BH102	1.00	Yes
BH110	0.30	Yes
BH110	1.00	Yes

Table 3 CAT Waste Analysis Results

In addition, ten representative samples were analysed for waste acceptance criteria testing, the results are summarised in Table 4:

Location	Depth (m)	Inert	Non-Hazardous	Hazardous
TP201	1.80			TOC, Loss on Ignition
TP203	1.50	Yes		
TP204	1.50		TOC	
TP205	0.50	Yes		
TP208	1.50		TOC, Antimony	Loss on Ignition
TP209	1.50			TOC, Loss on Ignition
BH103	0.50	Yes		
BH105	1.00		TOC	
BH106	0.30	Yes		
BH109	1.50		TOC	

Table 4 WAC Test Results



Three of the samples have fallen into the hazardous waste classification on account of marginal exceedances of TOC and loss on ignition (organic matter). It is possible that a receiving landfill operator will accept this material as non-hazardous, though this would require confirmation from the proposed operator.

Any waste soils which include asbestos will require asbestos quantification analysis to determine their disposal classification. Where the concentration of free asbestos fibres exceed 0.1% the material would be deemed hazardous. Furthermore, any material containing fragments of ACM containing more than 0.1% asbestos would also be deemed hazardous. It is recommended that the results be passed onto the landfill operator and company who are to remove any soils from site, as different landfill operators use different forms of classification.

Natural soils (River Terrace Deposits and Chalk) are likely be classified as Inert Waste (under the respective EWC codes for naturally occurring soils), suitable for disposal at an inert landfill facility.



6.0 DISCOVERY STRATEGY

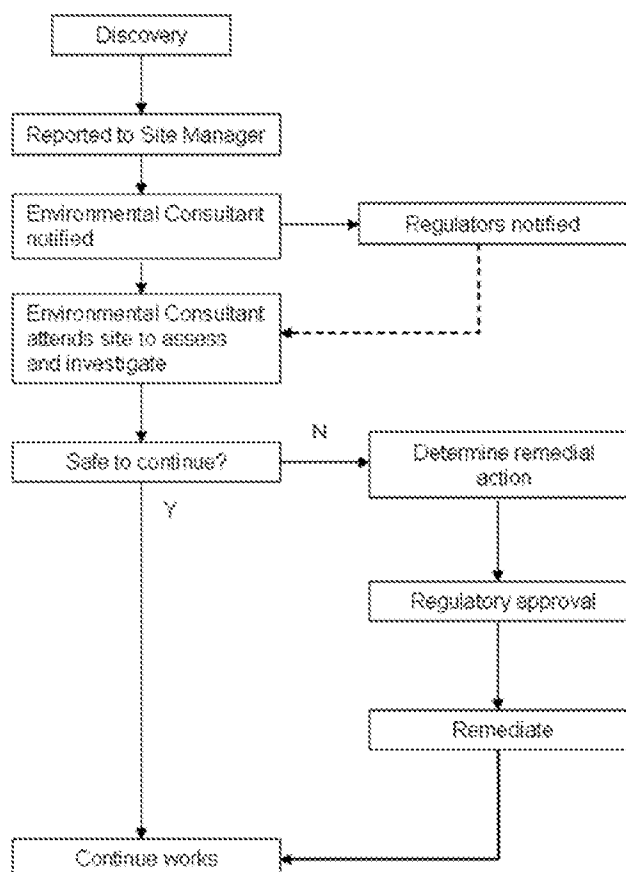
Whilst the site has been the subject of several phases of investigation and assessment, it remains possible that previously unexpected soil conditions may be encountered during the process of site preparation and construction.

Examples may include oily pockets within the soil, pockets of cement boarding or fibrous materials within the soil, black ashly materials, soils exhibiting strong odours, brightly coloured materials, and former structures or brickwork.

Should previously undiscovered contamination be encountered during the demolition/construction of the new buildings the following course of action should be adhered to:

- Works in the area of the suspected contamination should cease immediately. The ground workers should report any suspected contamination immediately to the Client's site supervisor. The supervisor should contact the Environmental Consultant, who should visit the site to assess the extent of the 'contamination'.
- The Environmental Consultant shall make records of their inspection, and pass details of these to the Local Authority.
- Where the conditions revealed differ from those previously anticipated, the Environmental Consultant shall take samples as deemed appropriate to be dispatched for appropriate chemical testing.
- Depending on the results of the testing either: 1) no further work will be required; 2) a further detailed risk assessment will be required; and/or 3) localised specific remedial measures will be necessary. Appraisal criteria will vary depending on the nature of the assessment.
- The results of any such testing will be sent to the Regulatory Authority for consultation. If further remediation is required, the Regulatory Authority will be informed of the date and time of the proposed works.
- Any further remediation will be undertaken in accordance with a method statement submitted to the Local Authority for approval. The works shall be supervised by the Environmental Consultant who shall provide a Verification Report for the Local Authorities purposes.

The process is summarised overleaf:



A copy of this strategy should be lodged on site, and provisions made to ensure that all workers are made aware of their responsibility to observe, report, and act on any potentially suspicious or contaminated materials they may encounter.



7.0 VERIFICATION

Verification is required to be undertaken throughout the course of the remediation works. The Verification Report will be submitted to the Client, NHBC and Local Authority for formal approval and Environment Agency if requested as part of any works completed under the Definition of Waste Code of Practice.

The Verification Report will refer to the works as set out within this RSVP and as required by any relevant planning conditions. The report will detail findings of any further investigation works (if undertaken on the site) and the remedial works undertaken within proposed private gardens and areas of managed soft landscaping, as well as include relevant site based information such as records from site inspections, locations where the impacted soils were excavated and re-used on site or disposed of and validation sampling where required.

The specification, installation and validation of gas mitigation measures within houses (including garages if applicable) and services will also be presented within the verification report.

Photographs of specific remedial or waste handling measures and an audit trail for any imported subsoil and Topsoil, including source, provenance, analytical results, placement location and thickness (should subsoil and/or Topsoil be imported).

A summary of verification proposals is presented in Table 5 below.

The remedial works will be inspected and validated by the Environmental Consultant (Geo-Environmental).



Remediation Strategy & Verification Plan

Reference	Principal requirements	Design or construction related	Site visit required by Qualified Geo-Environmental Engineer	Supporting documentation
1.0 Verification general principles	Geo-Environmental have been commissioned to supervise remedial works at Cornfield Close, Littlehampton. These works require excavations of impacted Made Ground and installation of a soil cover system within private gardens and areas of soft landscaping and the installation of gas protection measures. The aforementioned work is in line with the approach adopted for site investigation and risk assessment and previously undertaken by Geo-Environmental in respect of the development.	Construction	Yes – See below	Details of construction programme to be provided by client/contractor.
2.0 Excavation of Made Ground	Reduced dig exercise to excavate Made Ground or raise the site to a depth of 650mm to be verified by Geo-Environmental.	Construction	Yes – 5 days' notice required	Regular visits to site required to confirm works being undertaken validation sampling within the natural soils following removal of the impacted material.
3.0 Cover System	Cover system to be constructed by the ground workers and inspected by the Environmental Consultant	Construction	Yes - 5 days' notice required	Samples to be taken and chemical test results presented in the report. Thickness and construction of cover system to be verified.
4.0 Gas protection measures	Gas Protection Measures to be included within proposed development to protect against methane and Carbon Dioxide identified from the onsite (wider site) former landfill.	Design and Construction	Yes - 5 days' notice required	Regular visits to site required to confirm works being undertaken and to validate the various stages of installation across the site.



Remediation Strategy & Verification Plan

Reference	Principal requirements	Design or construction related	Site visit required by Qualified Geo-Environmental Engineer	Supporting documentation
5.0 Waste Management	Waste soils arising from the site strip will be disposed of appropriately with WAC testing undertaken once soils for disposal have been identified. The results should be presented to the landfill site prior to removal for confirmation of the classification.	Design and Construction	No (unless further testing required where 5 days' notice required)	Chemical test results (WAC)
	Waste tickets for the removal of arisings should be compiled for submission as part of the verification report for each phase of the development. The waste tickets will be required to demonstrate that the approximate amount of material being removed is equal to the summed volume on the waste tickets.			Waste tickets
	Where it is demonstrated that there is a need for materials to be re-used on site and that the risk is acceptable, soils may be re-used on site under the Definition of Waste Code of Practice under a Materials Management Plan for the site.			Records of material movements on site to be provided for inclusion in the validation report. (Assumed to be recorded by Ground workers, if not then independent inspections will be required.)
6.0 Imported Soils	In-situ testing of any soils imported onto site for landscaping purposes will be carried out after placement at a frequency of one sample per 50m ³ or one sample per landscaped area (whichever is the smallest) with comparison of results to assessment criteria for residential end use.	Construction	Yes	Pre import certification verifying the chemical quality of the topsoil and subsoil to be provided to the Environmental Consultant for review prior to Importation.

Table 5 Details of verification visits required on site



Project:	Cornfield Close, Littlehampton			Title	Site Location Plan	
Client:	Thakeham Client			Geo-Environmental Services Ltd Unit 7 Danworth Farm, Cuckfield Road Hurstpierpoint, West Sussex BN6 9GL +44(0)1273 832972 www.gesl.net  Geo-Environmental		
Ref No:	GE17106	Revision:	v1			
Drawn:	AP	Date:	04/10/2018			
Figure:	1	Scale:	Not To Scale			



Geo-Environmental

Title : Figure 2 - Exploratory Hole Location Plan

Scale: 1:2000

Engineer: Anthony

Client : Thakeham Client

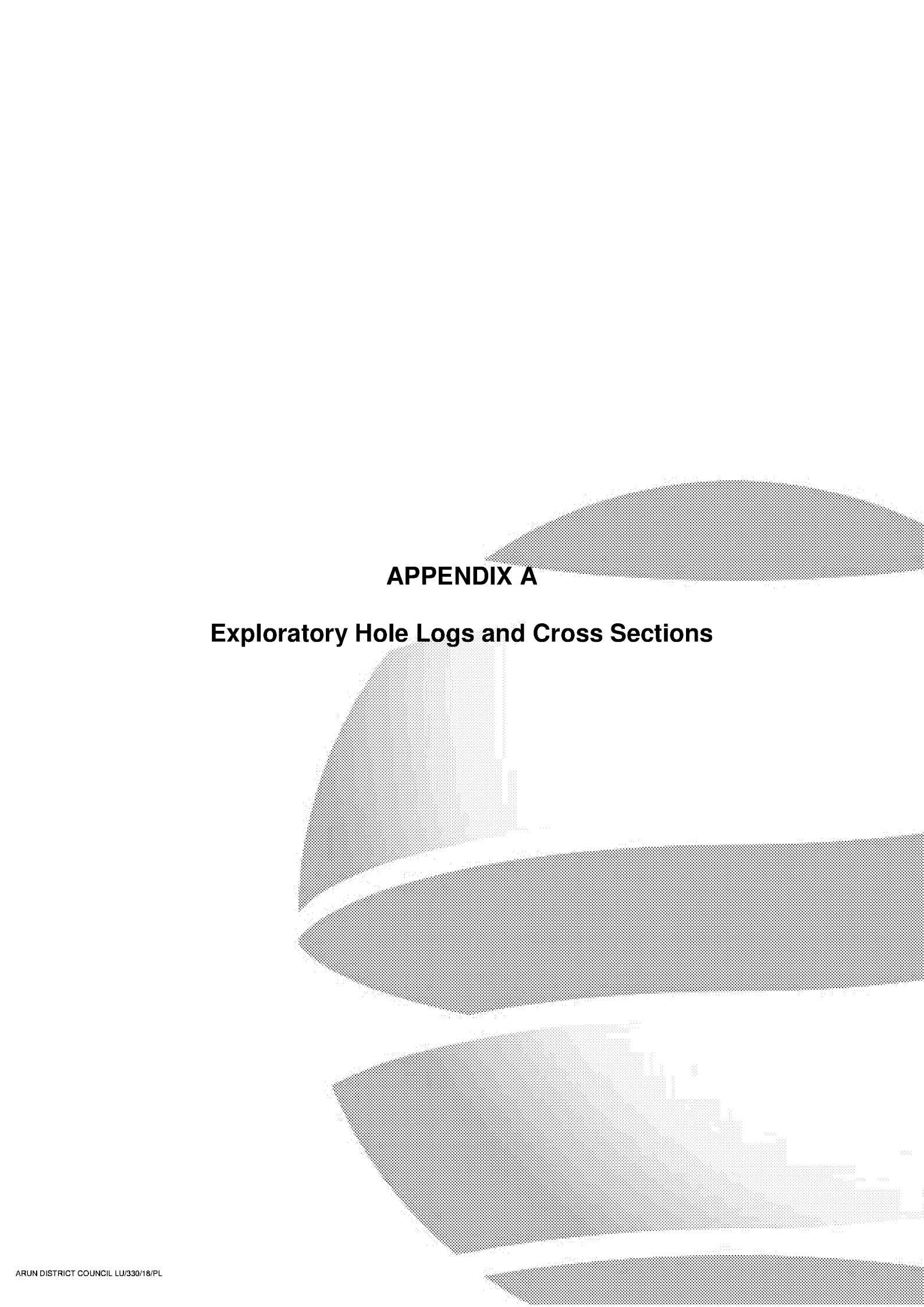


Geo-Environmental

Legend Key

-  Locations By Type - Empty
-  Locations By Type - CP
-  Locations By Type - TP
-  Locations By Type - WLS
-  Locations By Type - DCP





APPENDIX A

Exploratory Hole Logs and Cross Sections

 Unit 7, Danworth Farm Hurstpierpoint BN6 9GL www.gesl.net		Borehole Log		Borehole No. BH101 Sheet 1 of 1	
Project Name: Cornfield Close, Littlehampton		Project No. GE17106		Co-ords: 503316E - 103288N	
Location: Littlehampton, West Sussex		Level: 8.03		Hole Type CP	
Client: Thakeham Client		Dates: 15/08/2018		Scale 1:50	
Logged By AP					

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.12	7.91		Grass overlying brown sandy silt. MADE GROUND	
	0.30	B						Dark brown clay with brick, concrete, glass and ash. MADE GROUND	
	0.30	ES							
	0.50	B							
	0.80	ES							
	1.00	B							
	1.00	ES							
	1.50 - 1.95	D							
	1.50	S		N=4 (1,0/1,1,1,1)					
	2.00	D							
	2.50	D			2.50	5.53		Brown and dark grey slightly sandy silty CLAY with rare fine gravel. RIVER TERRACE DEPOSITS	
	3.00 - 3.45	D			3.00	5.03		Medium dense brown slightly gravelly, very clayey SAND (gravel is fine to medium and sub-angular). RIVER TERRACE DEPOSITS	
	3.00	S		N=17 (3,4/4,4,4,5)					
	3.50	D							
	4.00	D							
	4.50 - 4.95	D							
	4.50	S		N=27 (5,6/6,6,7,8)					
	5.00	D							
	5.50	D			5.40	2.63		Recovered as structureless CHALK composed of sub-angular to rounded gravel. Clasts are weak, low to medium density, off-white within an off-white matrix. CHALK	
	6.00 - 6.45	D							
6.00	S		N=43 (5,7/15,9,10,9)						
6.50	D								
7.00	D								
7.50 - 7.95	D								
7.50	S		N=25 (4,5/5,8,6,6)						
8.00	D								
8.50	D								
9.00 - 9.45	D								
9.00	S		N=42 (6,6/8,9,11,14)						
9.50	D								
10.00	D			10.00	-1.97		End of Borehole at 10.00m		

Casing		Water Strikes (mbgl)		Chiselling (mbgl)		Remarks	
Diameter	Depth (m)	Depth Strike	Rose to	Depth from	Depth to		
200	2.50	7.50	7.00				
150	10.00						



Geo-Environmental

Unit 7, Danworth Farm
Hurstpierpoint
BN6 9GL
www.gesl.net

Borehole Log

Borehole No.

BH102

Sheet 1 of 2

Project Name: Cornfield Close, Littlehampton

Project No.
GE17106

Co-ords: 503373E - 103317N

Hole Type
CP

Location: Littlehampton, West Sussex

Level: 7.85

Scale
1:50

Client: Thakeham Client

Dates: 13/08/2018

Logged By
AP

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description				
		Depth (m)	Type	Results								
		0.30	B	N=6 (2,2/1,1,1,3)	0.15	7.70		Grass overlying brown sandy silt.	1			
		0.30	ES					MADE GROUND				
		0.50	B					Dark brown clay with brick, concrete, glass and ash.				
		0.50	ES					MADE GROUND				
		1.00	B									
		1.00	ES									
		1.50 - 1.95	B	N=22 (4,4/5,5,5,7)	2.10	5.74		Grey brown medium sand.	2			
		1.50 - 1.95	D					MADE GROUND				
		1.50 - 1.95	ES					Medium dense orangish brown very clayey SAND with rare fine to medium sub-rounded gravel.				
		1.50	C					RIVER TERRACE DEPOSITS				
		2.00	D					2.30		5.54		
		2.50	D									
		3.00 - 3.45	D	N=18 (3,4/4,4,5,5)	3.80	4.04		Recovered as structureless CHALK composed of sub-angular to rounded gravel. Clasts are weak, low to medium density, off-white within an off-white matrix.	3			
		3.00	S					CHALK				
		3.50	D									
		4.00	D									
		4.50 - 4.95	D	N=18 (6,4/6,4,4,4)					4			
		4.50	S									
		5.00	D									
		6.00 - 6.45	D	N=53 (14,10/9,9,18,17)					5			
		6.00	S									
		6.50	D									
		7.00	D									
		7.50	U						6			
		7.50 - 7.95	D									
		8.00	D									
		8.50	D									
9.00 - 9.45	D						7					
9.00	S											
9.50	D						8					
Continued on Next Sheet									9			
									10			
Casing		Water Strikes (mbgl)		Chiselling (mbgl)		Remarks						
Diameter	Depth (m)	Depth Strike	Rose to	Depth from	Depth to							
200	2.50	7.50	7.00									
150	15.00											





Geo-Environmental

Unit 7, Danworth Farm
Hurstpierpoint
BN6 9GL
www.gesl.net

Borehole Log

Borehole No.

BH102

Sheet 2 of 2

Project Name: Cornfield Close, Littlehampton

Project No.
GE17106

Co-ords: 503373E - 103317N

Hole Type
CP

Location: Littlehampton, West Sussex

Level: 7.85

Scale
1:50

Client: Thakeham Client

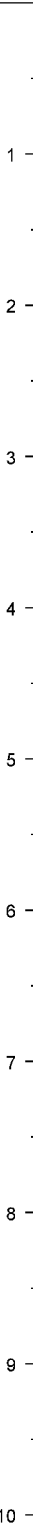
Dates: 13/08/2018

Logged By
AP

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description						
		Depth (m)	Type	Results										
		10.50	D	N=37 (8,8/7,11,10,9)	15.00	-7.16								
		10.50 - 10.95	D											
		10.50	S											
		11.00	D											
		N=50 (7,6/12,20,12,6)												
										12.00 - 12.45	D			
										12.00	S			
		13.00	D	N=50 (15,10/14,15,19,2)										
		13.50 - 13.95	D											
		13.50	S											
		14.00	D	N=50 (10,11/13,13,19,5)										
		14.50	D											
		14.50 - 14.95	D											
		14.50	S											
15.00		D												
End of Borehole at 15.00m														
Casing		Water Strikes (mbgl)		Chiselling (mbgl)		Remarks								
Diameter	Depth (m)	Depth Strike	Rose to	Depth from	Depth to									
200	2.50	7.50	7.00											
150	15.00													



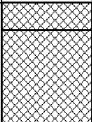
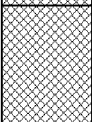
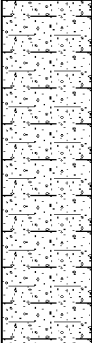
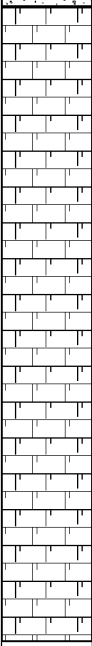
 Unit 7, Danworth Farm Hurstpierpoint BN6 9GL www.gesl.net		Borehole Log		Borehole No. BH103 Sheet 1 of 1	
Project Name: Cornfield Close, Littlehampton		Project No. GE17106		Co-ords: 503448E - 103254N	
Location: Littlehampton, West Sussex		Level: 7.92		Hole Type CP	
Client: Thakeham Client		Dates: 23/08/2018		Scale 1:50	
Logged By					

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description						
		Depth (m)	Type	Results										
		0.12			0.12	7.80		Grass overlying brown sandy silt.						
								MADE GROUND						
		0.30	B		0.60	7.32		Light brown clayey sandy silt with frequent brick and concrete fragments.						
		0.30	ES											
		0.50	B											
		0.50	ES											
		1.00	B		2.40	5.52		Orange brown clayey SAND. RIVER TERRACE DEPOSITS						
		1.00	ES											
		1.50 - 1.95	D	N=8 (2,2/2,2,2,2)	3.00	4.92		Medium dense brown slightly gravelly clayey SAND (gravels fine to medium and sub-angular). RIVER TERRACE DEPOSITS						
		1.50	S											
		2.00	D											
		2.50	B											
		2.50	ES		3.50	4.42		Medium dense orangish brown very gravelly, very clayey SAND (gravel is fine to coarse and sub-angular). RIVER TERRACE DEPOSITS						
		3.00 - 3.45	D	N=30 (5,6/6,8,8,8)						3.00	4.92		Medium dense brown slightly gravelly clayey SAND (gravels fine to medium and sub-angular). RIVER TERRACE DEPOSITS	
		3.00	S											
		3.50	D											
		4.00	D											
		4.50 - 4.95	D	N=17 (3,3/4,4,4,5)	6.20	1.72		Recovered as structureless CHALK composed of sub-angular to rounded gravel. Clasts are weak, low to medium density, off-white within an off-white matrix. CHALK						
		4.50	S											
		5.00	D											
	5.50	D												
	6.00 - 6.45	D	N=10 (2,2/2,3,3,2)	6.20	1.72		Recovered as structureless CHALK composed of sub-angular to rounded gravel. Clasts are weak, low to medium density, off-white within an off-white matrix. CHALK							
	6.00	S												
	6.50	D												
	7.00	D												
	7.50 - 7.95	D	N=29 (4,5/7,7,8,7)	6.20	1.72		Recovered as structureless CHALK composed of sub-angular to rounded gravel. Clasts are weak, low to medium density, off-white within an off-white matrix. CHALK							
	7.50	S												
	8.00	D												
	8.50	D												
	9.00 - 9.45	D	N=30 (5,5/6,8,7,9)	6.20	1.72		Recovered as structureless CHALK composed of sub-angular to rounded gravel. Clasts are weak, low to medium density, off-white within an off-white matrix. CHALK							
	9.00	S												
	9.50	D												
	10.00	D												
	10.00			10.00	-2.08		End of Borehole at 10.00m							

Casing		Water Strikes (mbgl)		Chiselling (mbgl)		Remarks
Diameter	Depth (m)	Depth Strike	Rose to	Depth from	Depth to	
200	3.00	9.00	9.00			
150	10.00					

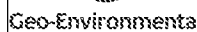


 Unit 7, Danworth Farm Hurstpierpoint BN6 9GL www.gesl.net		Borehole Log		Borehole No. BH104 Sheet 1 of 2	
Project Name: Cornfield Close, Littlehampton		Project No. GE17106		Co-ords: 503345E - 103287N	
Location: Littlehampton, West Sussex		Level: 8.13		Hole Type CP	
Client: Thakeham Client		Dates: 14/08/2018		Scale 1:50	
Logged By AP					

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30	B	N=12 (4,4/4,4,2,2)	0.18	7.95	 Grass overlying brown sandy silt. MADE GROUND Light brown clayey sandy silt with frequent brick and concrete fragments. MADE GROUND	1	
	0.30	ES							
	0.50	B							
	0.50	ES							
			1.00	B		1.60	6.53	 Dark brown clay with brick, concrete, glass and ash. MADE GROUND	2
	1.00	ES							
	1.50 - 1.80	D							
	1.50	S							
			2.00	D	N=20 (1,3/4,5,5,6)	2.90	5.23	 Medium dense brown very clayey SAND with rare fine gravel. RIVER TERRACE DEPOSITS	3
	2.50	D							
	3.00 - 3.45	D							
	3.00	S							
			3.50	D	N=30 (5,5/7,7,7,9)	3.50	4.63	 Medium dense brown slightly clayey silty gravelly SAND (gravel is fine to medium and sub-angular). RIVER TERRACE DEPOSITS	4
	4.50 - 4.95	D							
	4.50	S							
	5.00	D							
			5.50	D	N=35 (5,8/8,9,9,9)	5.80	2.33	 Recovered as structureless CHALK composed of sub-angular to rounded gravel. Clasts are weak, low to medium density, off-white within an off-white matrix. CHALK	5
	6.00 - 6.45	D							
6.00	S								
6.50	D								
		7.00	D	N=33 (4,5/8,8,8,9)				6	
7.50 - 7.95	D								
7.50	S								
8.00	D								
		9.00	D	N=47 (7,7/7,8,16,16)				7	
9.00 - 9.45	D								
9.00	S								
10.00	D								
		10.00	D					8	
								9	
								10	
Continued on Next Sheet									

Casing		Water Strikes (mbgl)		Chiselling (mbgl)		Remarks
Diameter	Depth (m)	Depth Strike	Rose to	Depth from	Depth to	
200	3.00	9.00	9.00			
150	15.00					





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Borehole Log

Borehole No.

BH104

Sheet 2 of 2

Project Name: Cornfield Close, Littlehampton

Project No.	GE17106
-------------	---------

Co-ords: 503345E - 103287N

Hole Type
CP

Location: Littlehampton, West Sussex

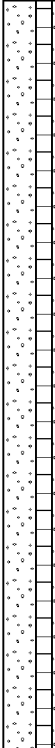
Level: 8.13

Scale
1:50

Client: Thakeham Client

Dates: 14/08/2018

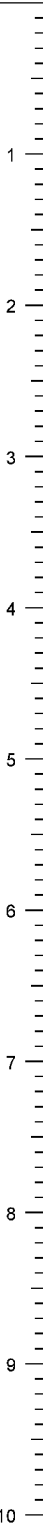
Logged By
AP

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
		10.50 - 10.95	D	N=46 (6,8/9,11,13,13)	15.00	-6.87				
		10.50	S							
		11.00	D							
		11.50	D							
		12.00 - 12.45	D	N=49 (6,10/11,11,13,14)						
		12.00	S							
		12.50	D							
		13.00	D							
		13.50 - 13.95	D	N=48 (5,9/12,12,11,13)						
		13.50	S							
		14.00	D							
		14.50	D	N=50 (8,8/9,10,10,21)						
		14.50 - 14.95	D							
		14.50	S							
		15.00	D							
End of Borehole at 15.00m								15		
									16	
									17	
									18	
									19	
									20	

Casing		Water Strikes (mbgl)		Chiselling (mbgl)		Remarks
Diameter	Depth (m)	Depth Strike	Rose to	Depth from	Depth to	
200	3.00	9.00	9.00			
150	15.00					



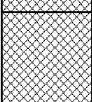
 Unit 7, Danworth Farm Hurstpierpoint BN6 9GL www.gesl.net		Borehole Log		Borehole No. BH105 Sheet 1 of 1	
Project Name: Cornfield Close, Littlehampton		Project No. GE17106		Co-ords: 503410E - 103272N	
Location: Littlehampton, West Sussex		Level: 8.39		Hole Type CP	
Client: Thakeham Client		Dates: 22/08/2018		Scale 1:50	
Logged By					

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.17	8.22		Grass overlying brown sandy silt.	
	0.30	B						MADE GROUND	
	0.30	ES						Light brown clayey sandy silt with frequent brick and concrete fragments.	
	0.50	B						MADE GROUND	
	0.50	ES			0.70	7.69		Dark brown, dark grey and black silty clayey sand with frequent ash, glass, brick concrete, metal, plastic and timber.	
	1.00	B						MADE GROUND	
	1.00	ES							
	1.50 - 1.95	D							
	1.50	S	N=24 (2,4/4,7,7,6)						
	2.00	D							
	2.50	D			2.50	5.89		Orange brown sandy CLAY.	
								RIVER TERRACE DEPOSITS	
	3.00 - 3.45	D			2.90	5.49		Medium dense orange brown medium SAND.	
	3.00	S	N=12 (2,2/2,3,3,4)					RIVER TERRACE DEPOSITS	
	3.50	D			3.50	4.89			
	4.00	D						Medium dense orangish brown gravelly clayey SAND (gravel is fine to coarse and sub-rounded to sub-angular).	
								RIVER TERRACE DEPOSITS	
	4.50 - 4.95	D							
	4.50	S	N=11 (2,2/3,2,3,3)						
	5.00	D							
5.50	D								
6.00 - 6.45	D			5.80	2.59		Medium dense orange brown clayey SAND with occasional flint gravel and rare chalk nodules.		
6.00	S	N=29 (4,6/6,6,8,9)					RIVER TERRACE DEPOSITS		
6.50	ES						...with dark blue staining and a slight hydrocarbon malodour between 6.5m and 7.0m bgl.		
7.00	D			7.00	1.39		Recovered as structureless CHALK composed of sub-angular to rounded gravel. Clasts are weak, low to medium density, off-white within an off-white matrix.		
7.00	ES						CHALK		
7.50 - 7.95	D								
7.50	S	N=28 (3,4/9,6,6,7)							
8.00	D								
9.00 - 9.45	D								
9.00	S	N=50 (4,6/13,13,14,10)							
9.50	D								
10.00	D			10.00	-1.61		End of Borehole at 10.00m		

Casing		Water Strikes (mbgl)		Chiselling (mbgl)		Remarks
Diameter	Depth (m)	Depth Strike	Rose to	Depth from	Depth to	
200	3.00	7.50	7.50			
150	10.00					



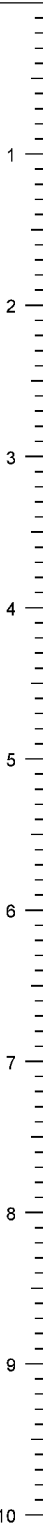
 Unit 7, Danworth Farm Hurstpierpoint BN6 9GL www.gesl.net		Borehole Log		Borehole No. BH106 Sheet 1 of 1	
Project Name: Cornfield Close, Littlehampton		Project No. GE17106		Co-ords: 503423E - 103210N	
Location: Littlehampton, West Sussex		Level: 7.60		Scale 1:50	
Client: Thakeham Client		Dates: 22/08/2018		Logged By	

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.15	7.45	 Grass overlying brown sandy silt. MADE GROUND		
	0.30	B							
	0.30	ES					 Light brown clayey sandy silt with frequent brick and concrete fragments. MADE GROUND		
	0.50	B							
	0.50	ES			0.65	6.95	 Dark brown, dark grey and black silty clayey sand with frequent ash, glass, brick concrete, metal, plastic and timber. MADE GROUND	1	
	1.00	B							
	1.00	ES							
	1.50 - 1.95	D							
	1.50	S	N=7 (1,1/2,1,2,2)						
	2.00	D						2	
	2.50	D							
	2.80	4.80	 Very soft orangish brown slightly gravelly sandy CLAY (gravel is fine to medium and sub-angular). RIVER TERRACE DEPOSITS	3					
	3.00 - 3.45	D							
	3.00	S	N=9 (1,2/3,2,2,2)						
	3.50	D						4	
	4.00	D							
	4.50 - 4.95	D					 Loose orangish brown very clayey gravelly SAND (gravel is fine to coarse and sub-angular). RIVER TERRACE DEPOSITS	4	
	4.50	S	N=9 (2,2/3,1,1,4)						
	5.00	D						5	
	5.50	D							
5.50	2.10	 Recovered as structureless CHALK composed of sub-angular to rounded gravel. Clasts are weak, low to medium density, off-white within an off-white matrix. CHALK	6						
6.00 - 6.45	D								
6.00	S	N=24 (4,8/5,5,6,8)					7		
6.50	D								
7.00	D						8		
7.50 - 7.95	D								
7.50	S	N=37 (11,14/8,8,10,11)					9		
8.00	D								
8.50	D						10		
9.00 - 9.45	D								
9.00	S	N=32 (3,5/6,8,8,10)							
9.50	D								
10.00	D			10.00	-2.40	End of Borehole at 10.00m			

Casing		Water Strikes (mbgl)		Chiselling (mbgl)		Remarks
Diameter	Depth (m)	Depth Strike	Rose to	Depth from	Depth to	
200	3.00	7.50	7.50			
150	10.00					



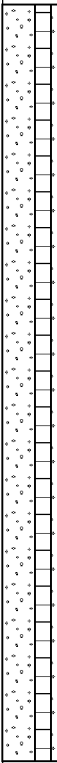
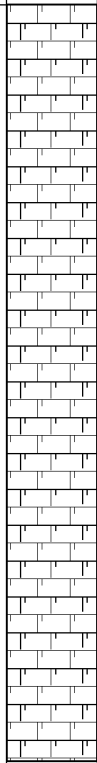
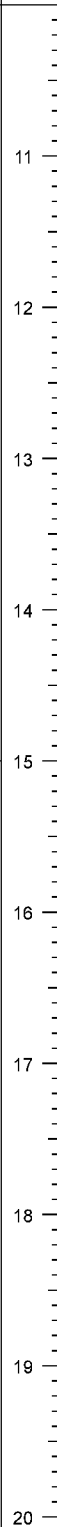
 Unit 7, Danworth Farm Hurstpierpoint BN6 9GL www.gesl.net		Borehole Log		Borehole No. BH107 Sheet 1 of 2	
Project Name: Cornfield Close, Littlehampton		Project No. GE17106		Co-ords: 503335E - 103245N	
Location: Littlehampton, West Sussex		Level: 8.04		Hole Type CP	
Client: Thakeham Client		Dates: 16/08/2018		Scale 1:50 Logged By AP	

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.12			0.12	7.92		Grass overlying brown sandy silt.	
								MADE GROUND	
		0.30	B		0.60	7.44		Light brown clayey sandy silt with frequent brick and concrete fragments.	
		0.30	ES						
		0.50	B						
		0.50	ES						
		1.00	B		2.40	5.64		Dark brown and dark grey clayey sand with frequent ash, brick, concrete, fabric, metal, timber and glass.	
		1.00	ES						
		1.50 - 1.95	D	N=6 (1,1/2,1,2,1)					
		1.50	C						
		2.00	D		3.00	5.04		Loose orangish brown gravelly silty very clayey SAND (gravel is fine to coarse and sub-angular). RIVER TERRACE DEPOSITS	
		2.50	D						
		3.00 - 3.45	D	N=8 (1,2/2,1,3,2)					
		3.00	S						
		3.50	D		5.90	2.14		Medium dense orangish brown sandy CLAY with rare fine sub-angular gravel. RIVER TERRACE DEPOSITS	
		4.00	D						
		4.50 - 4.95	D	N=11 (2,3/3,3,2,3)					
		4.50	S						
		5.00	D		6			Recovered as structureless CHALK composed of sub-angular to rounded gravel. Clasts are weak, low to medium density, off-white within an off-white matrix. CHALK	
		5.50	D						
	6.00 - 6.45	D	N=18 (3,3/4,4,5,5)						
	6.00	S							
	6.50	D		7					
	7.00	D							
	7.50 - 7.95	D	N=30 (6,7/7,8,8,7)						
	7.50	S							
	8.00	D		8					
	8.50	D							
	9.00 - 9.45	D	N=25 (3,5/5,6,6,8)						
	9.00	S							
	9.50	D		9					
	10.00	D							
Continued on Next Sheet									10

Casing		Water Strikes (mbgl)		Chiselling (mbgl)		Remarks
Diameter	Depth (m)	Depth Strike	Rose to	Depth from	Depth to	
200	3.00	7.50	7.50			
150	15.00					



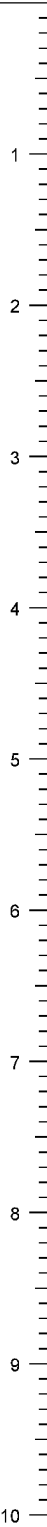
 Unit 7, Danworth Farm Hurstpierpoint BN6 9GL www.gesl.net		Borehole Log				Borehole No. BH107 Sheet 2 of 2	
Project Name: Cornfield Close, Littlehampton		Project No. GE17106		Co-ords: 503335E - 103245N		Hole Type CP	
Location: Littlehampton, West Sussex				Level: 8.04		Scale 1:50	
Client: Thakeham Client				Dates: 16/08/2018		Logged By AP	

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		10.50 - 10.95 10.50	D S	N=26 (4,5/6,6,7,7)	15.00	-6.96			
		11.00	D						
		11.50	D						
		12.00 - 12.45 12.00	D S	N=44 (8,9/12,11,9,12)					
		12.50	D						
		13.00	D						
		13.50 - 13.95 13.50	D S	N=44 (7,10/12,11,9,12)					
		14.00	D						
		14.50 14.50 - 14.95 14.50	D D S	N=45 (6,8/8,9,13,15)					
		15.00	D						
End of Borehole at 15.00m									

Casing		Water Strikes (mbgl)		Chiselling (mbgl)		Remarks
Diameter	Depth (m)	Depth Strike	Rose to	Depth from	Depth to	
200	3.00	7.50	7.50			
150	15.00					



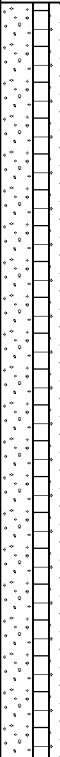
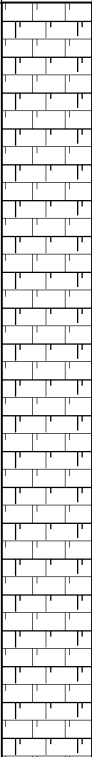
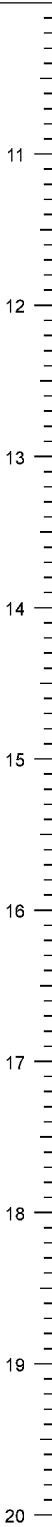
 Unit 7, Danworth Farm Hurstpierpoint BN6 9GL www.gesl.net		Borehole Log		Borehole No. BH108 Sheet 1 of 2	
Project Name: Cornfield Close, Littlehampton		Project No. GE17106		Co-ords: 503297E - 103196N	
Location: Littlehampton, West Sussex		Level: 8.34		Hole Type CP	
Client: Thakeham Client		Dates: 20/08/2018		Scale 1:50	
Logged By AP					

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.15			0.15	8.19		Grass overlying brown sandy silt.	
								MADE GROUND	
		0.30	B					Light brown clayey sandy silt with frequent brick and concrete fragments.	
		0.30	ES					MADE GROUND	
		0.50	B					Dark brown and dark grey clayey sand with frequent ash, brick, concrete, fabric, metal, timber and glass.	
		0.50	ES					MADE GROUND	
		1.00	B						
		1.00	ES						
		1.50 - 1.95	B						
		1.50 - 1.95	ES						
		1.50	C	N=3 (1,1/1,1,0,1)					
		2.00	D						
		2.50	D		2.40	5.94		Very soft brown mottled dark grey slightly gravelly silty sandy CLAY (gravel is fine to medium and sub-angular). RIVER TERRACE DEPOSITS	
		3.00 - 3.45	D						
		3.00	S	N=6 (1,1/1,2,2,1)	3.10	5.24		Loose orange brown medium SAND. RIVER TERRACE DEPOSITS	
		3.50	D						
		4.00	D						
		4.50 - 4.95	D						
		4.50	S	N=6 (1,1/1,2,2,1)	4.50	3.84		Loose light brown and orange brown slightly clayey SAND with frequent flint gravel. RIVER TERRACE DEPOSITS	
		5.00	D						
	5.50	D							
	6.00 - 6.45	D							
	6.00	S	N=7 (1,1/1,2,2,2)	6.00	2.34		Recovered as structureless CHALK composed of sub-angular to rounded gravel. Clasts are weak, low to medium density, off-white within an off-white matrix. CHALK		
	6.50	D							
	7.00	D							
	7.50 - 7.95	D							
	7.50	S	N=23 (6,7/6,6,5,6)						
	8.00	D							
	8.50	D							
	9.00 - 9.45	D							
	9.00	S	N=29 (9,11/7,7,7,8)						
	9.50	D							
	10.00	D							
Continued on Next Sheet									

Casing		Water Strikes (mbgl)		Chiselling (mbgl)		Remarks
Diameter	Depth (m)	Depth Strike	Rose to	Depth from	Depth to	
200	3.00	7.50	7.50			
150	15.00					



 Geo-Environmental www.gesl.net		Unit 7, Danworth Farm Hurstpierpoint BN6 9GL				Borehole Log				Borehole No. BH108	
Project Name: Cornfield Close, Littlehampton		Project No. GE17106		Co-ords: 503297E - 103196N		Hole Type CP					
Location: Littlehampton, West Sussex		Level: 8.34		Scale 1:50		Logged By AP					
Client: Thakeham Client		Dates: 20/08/2018									

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		10.50 - 10.95 10.50	D S	N=44 (4,7/13,11,11,9)	15.00	-6.66			
		11.00	D						
		11.50	D						
		12.00 - 12.45 12.00	D S	N=45 (8,7/9,9,14,13)					
		12.50	D						
		13.00	D						
		13.50 - 13.95 13.50	D S	50 (10,10/50 for 225mm)					
		14.00	D						
		14.50 14.50 - 14.95 14.50	D D S	N=50 (6,8/11,13,22,4)					
		15.00	D						
End of Borehole at 15.00m 									

Casing		Water Strikes (mbgl)		Chiselling (mbgl)		Remarks
Diameter	Depth (m)	Depth Strike	Rose to	Depth from	Depth to	
200 150	3.00 15.00	7.50	7.50			



 Unit 7, Danworth Farm Hurstpierpoint BN6 9GL www.gesl.net		Borehole Log		Borehole No. BH109 Sheet 1 of 1	
Project Name: Cornfield Close, Littlehampton		Project No. GE17106		Co-ords: 503368E - 103217N	
Location: Littlehampton, West Sussex		Level: 7.91		Hole Type CP	
Client: Thakeham Client		Dates: 16/08/2018		Scale 1:50	
Logged By AP					

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.12			0.12	7.79	 Grass overlying brown sandy silt. MADE GROUND	 Dark brown clay with brick, concrete, glass and ash. MADE GROUND	
	0.30	B							
	0.30	ES							
	0.50	B							
	0.50	ES							
	1.00	B							
	1.00	ES							
	1.50 - 1.95	B							
	1.50 - 1.95	ES							
	1.50	C	N=9 (1,3/3,2,3,1)						
	2.00	D							
	2.50	D							
	2.80								
	3.00 - 3.45	D							
	3.00	S	N=7 (3,3/2,2,2,1)						
	3.50	D							
	3.80								
	4.00	D							
	4.11								
	4.50 - 4.95	D							
4.50	S	N=14 (2,3/3,3,4,4)							
5.00	D								
5.50	D								
5.50									
5.70									
6.00 - 6.45	D								
6.00	S	N=21 (3,4/4,5,5,7)							
6.50	D								
7.00	D								
7.50 - 7.95	D								
7.50	S	N=33 (4,6/8,8,8,9)							
8.00	D								
8.50	D								
9.00 - 9.45	D								
9.00	S	N=43 (4,8/8,12,12,11)							
9.50	D								
10.00	D								
10.00									

Casing		Water Strikes (mbgl)		Chiselling (mbgl)		Remarks	
Diameter	Depth (m)	Depth Strike	Rose to	Depth from	Depth to		
200	3.00	7.50	7.50				
150	10.00						

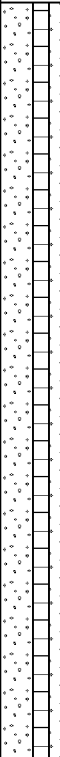
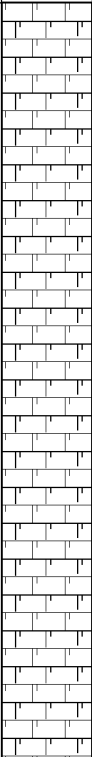
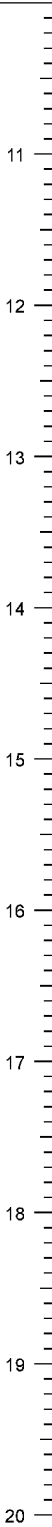
 Unit 7, Danworth Farm Hurstpierpoint BN6 9GL www.gesl.net		Borehole Log				Borehole No. BH110 Sheet 1 of 2	
Project Name: Cornfield Close, Littlehampton		Project No. GE17106		Co-ords: 503393E - 103181N		Hole Type CP	
Location: Littlehampton, West Sussex				Level: 7.83		Scale 1:50	
Client: Thakeham Client				Dates: 21/08/2018		Logged By AP	

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30	B		0.17	7.66	 Grass overlying brown sandy silt. MADE GROUND Light brown clayey sandy silt with frequent brick and concrete fragments. MADE GROUND	1	
		0.30	ES						
		0.50	B						
		0.50	ES						
		1.00	B	N=4 (1,0/1,1,1,1)	0.70	7.13	 Dark brown and dark grey clayey sand with frequent ash, brick, concrete, fabric, metal, timber and glass. MADE GROUND	2	
		1.00	ES						
		1.50 - 1.95	D						
		1.50	S						
		2.00	D		2.50	5.33	 Greenish grey and grey mottled slightly gravelly silty sandy CLAY (gravel is fine to medium and sub-angular to sub-rounded). RIVER TERRACE DEPOSITS Loose to medium dense light brown and orange brown slightly clayey SAND with frequent flint gravel. RIVER TERRACE DEPOSITS	3	
		2.50	D						
		3.00 - 3.45	D						
		3.00	S						
		3.50	D	N=6 (1,1/1,2,1,2)	3.00	4.83	 Loose to medium dense light brown and orange brown slightly clayey SAND with frequent flint gravel. RIVER TERRACE DEPOSITS	4	
		4.00	D						
		4.50 - 4.95	D						
		4.50	S						
		5.00	D	N=11 (2,2/2,3,3,3)	4.60	3.23	 Recovered as structureless CHALK composed of sub-angular to rounded gravel. Clasts are weak, low to medium density, off-white within an off-white matrix. CHALK	5	
		5.50	D						
		6.00 - 6.45	D						
		6.00	S						
	6.50	D	N=38 (3,3/9,8,11,10)			 Recovered as structureless CHALK composed of sub-angular to rounded gravel. Clasts are weak, low to medium density, off-white within an off-white matrix. CHALK	6		
	7.00	D							
	7.50 - 7.95	D							
	7.50	S							
	8.00	D	N=25 (4,5/5,6,7,7)			 Recovered as structureless CHALK composed of sub-angular to rounded gravel. Clasts are weak, low to medium density, off-white within an off-white matrix. CHALK	7		
	8.50	D							
	9.00 - 9.45	D							
	9.00	S							
	9.50	D	N=29 (6,6/6,8,7,8)			 Recovered as structureless CHALK composed of sub-angular to rounded gravel. Clasts are weak, low to medium density, off-white within an off-white matrix. CHALK	8		
	10.00	D							
Continued on Next Sheet								10	

Casing		Water Strikes (mbgl)		Chiselling (mbgl)		Remarks
Diameter	Depth (m)	Depth Strike	Rose to	Depth from	Depth to	
200	3.00	9.00	9.00			
150	15.00					



 Unit 7, Danworth Farm Hurstpierpoint BN6 9GL www.gesl.net		Borehole Log				Borehole No. BH110 Sheet 2 of 2	
Project Name: Cornfield Close, Littlehampton		Project No. GE17106		Co-ords: 503393E - 103181N		Hole Type CP	
Location: Littlehampton, West Sussex				Level: 7.83		Scale 1:50	
Client: Thakeham Client				Dates: 21/08/2018		Logged By AP	

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		10.50 - 10.95 10.50	D S	N=28 (12,12/7,6,6,9)	15.00	-7.17			
		11.00	D						
		11.50	D						
		12.00 - 12.45 12.00	D S	N=32 (6,14/6,8,8,10)					
		12.50	D						
		13.00	D						
		13.50 - 13.95 13.50	D S	50 (15,10/50 for 150mm)					
		14.00	D						
		14.50 - 14.95 14.50	D S	N=32 (8,10/9,9,6,8)					
		15.00	D						
End of Borehole at 15.00m									

Casing		Water Strikes (mbgl)		Chiselling (mbgl)		Remarks
Diameter	Depth (m)	Depth Strike	Rose to	Depth from	Depth to	
200	3.00	9.00	9.00			
150	15.00					





Unit 7, Danworth Farm
Hurstpierpoint
BN6 9GL

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Trial Pit Log

Trial Pit No

DCP10

Sheet 1 of 1

Project Name: Cornfield Close, Littlehampton

Project No.
GE17106

Co-ords: 503384.25 - 103256.13
Level: 8.18

Date
15/08/2018

Location: Littlehampton, West Sussex

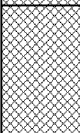
Dimensions
(m):

Scale
1:25

Client: Thakeham Client

Depth
0.60

Logged
AP

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.17	8.01		Grass overlying dark brown sandy silt. MADE GROUND	
							Light brown very sandy silt with brick and concrete fragments. MADE GROUND	
				0.60	7.58			-----End of Pit at 0.60m-----
								1 -
								2 -
								3 -
								4 -
								5 -
Water Strike		Remarks						
Depth Strike								
		Stability						







Unit 7, Danworth Farm
Hurstpierpoint
BN6 9GL

Geo-Environmental www.gesl.net

Trial Pit Log

Trial Pit No

DCP12

Sheet 1 of 1

Project Name: Cornfield Close, Littlehampton

Project No.
GE17106

Co-ords: 503362.21 - 103208.34
Level: 7.95

Date
15/08/2018

Location: Littlehampton, West Sussex

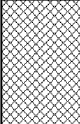
Dimensions
(m):

Scale
1:25

Client: Thakeham Client

Depth
0.60

Logged
AP

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.18	7.77		Grass overlying dark brown sandy silt. MADE GROUND	
							Dark brown very sandy silt with glass, brick and concrete fragments. MADE GROUND	
				0.60	7.35		-----End of Pit at 0.60m	
								1 -
								2 -
								3 -
								4 -
								5 -
Water Strike		Remarks						
Depth Strike								
		Stability						







Unit 7, Danworth Farm
Hurstpierpoint
BN6 9GL

Geo-Environmental www.gesl.net

Trial Pit Log

Trial Pit No

DCP14

Sheet 1 of 1

Project Name: Cornfield Close, Littlehampton

Project No.
GE17106

Co-ords: 503320.39 - 103212.94
Level: 8.40

Date
15/08/2018

Location: Littlehampton, West Sussex

Dimensions
(m):

Scale
1:25

Client: Thakeham Client

Depth
0.60

Logged
AP

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.10	8.30		Grass overlying dark brown sandy silt. MADE GROUND	
							Light brown very sandy silt with brick and concrete fragments. MADE GROUND	
				0.60	7.80		End of Pit at 0.60m	
								1
								2
								3
								4
								5
Water Strike		Remarks						
Depth Strike		Stability						





Unit 7, Danworth Farm
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Trial Pit Log

Trial Pit No

DCP15

Sheet 1 of 1

Project Name: Cornfield Close, Littlehampton

Project No.
GE17106

Co-ords: 503317.81 - 103236.41
Level: 8.08

Date
15/08/2018

Location: Littlehampton, West Sussex

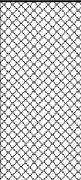
Dimensions
(m):

Scale
1:25

Client: Thakeham Client

Depth
0.60

Logged
AP

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.60	7.48		Dark brown and black silty sand with brick, concrete and glass. MADE GROUND	
							End of Pit at 0.60m	
								1
								2
								3
								4
								5
Water Strike		Remarks						
Depth Strike		Stability						





Unit 7, Danworth Farm
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Trial Pit Log

Trial Pit No

DCP17

Sheet 1 of 1

Project Name: Cornfield Close, Littlehampton

Project No.
GE17106

Co-ords: 503322.07 - 103280.53
Level: 8.21

Date
15/08/2018

Location: Littlehampton, West Sussex

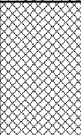
Dimensions
(m):

Scale
1:25

Client: Thakeham Client

Depth
0.60

Logged
AP

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.15	8.06		Grass overlying dark brown sandy silt. MADE GROUND	
							Light brown very sandy silt with brick and concrete fragments. MADE GROUND	
				0.60	7.61		End of Pit at 0.60m	
								1
								2
								3
								4
								5
Water Strike		Remarks						
Depth Strike		Stability						





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Trial Pit Log

Trial Pit No

DCP19

Sheet 1 of 1

Project Name: Cornfield Close, Littlehampton

Project No.
GE17106

Co-ords: 503325.48 - 103308.59
Level: 7.76

Date
15/08/2018

Location: Littlehampton, West Sussex

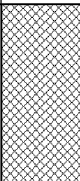
Dimensions
(m):

Scale
1:25

Client: Thakeham Client

Depth
0.60

Logged
AP

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.60	7.16		Dark brown and black silty sand with brick, concrete and glass. MADE GROUND	
							End of Pit at 0.60m	1
								2
								3
								4
								5
Water Strike		Remarks						
Depth Strike								
		Stability						







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Trial Pit Log

Trial Pit No

DCP2

Sheet 1 of 1

Project Name: Cornfield Close, Littlehampton

Project No.
GE17106

Co-ords: 503444.94 - 103290.96
Level: 7.60

Date
15/08/2018

Location: Littlehampton, West Sussex

Dimensions
(m):

Scale
1:25

Client: Thakeham Client

Depth
0.60

Logged
AP

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.12	7.48		Grass overlying dark brown sandy silt. MADE GROUND	
							Light brown very sandy silt with brick and concrete fragments. MADE GROUND	
				0.58 0.60	7.02 7.00		Dark brown and black silty sand with brick, concrete and glass. MADE GROUND	
							End of Pit at 0.60m	
								1
								2
								3
								4
								5
Water Strike		Remarks						
Depth Strike		Stability						





Unit 7, Danworth Farm
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Trial Pit Log

Trial Pit No

DCP20

Sheet 1 of 1

Project Name: Cornfield Close, Littlehampton

Project No.
GE17106

Co-ords: 503345.35 - 103296.07
Level: 8.10

Date
15/08/2018

Location: Littlehampton, West Sussex

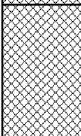
Dimensions
(m):

Scale
1:25

Client: Thakeham Client

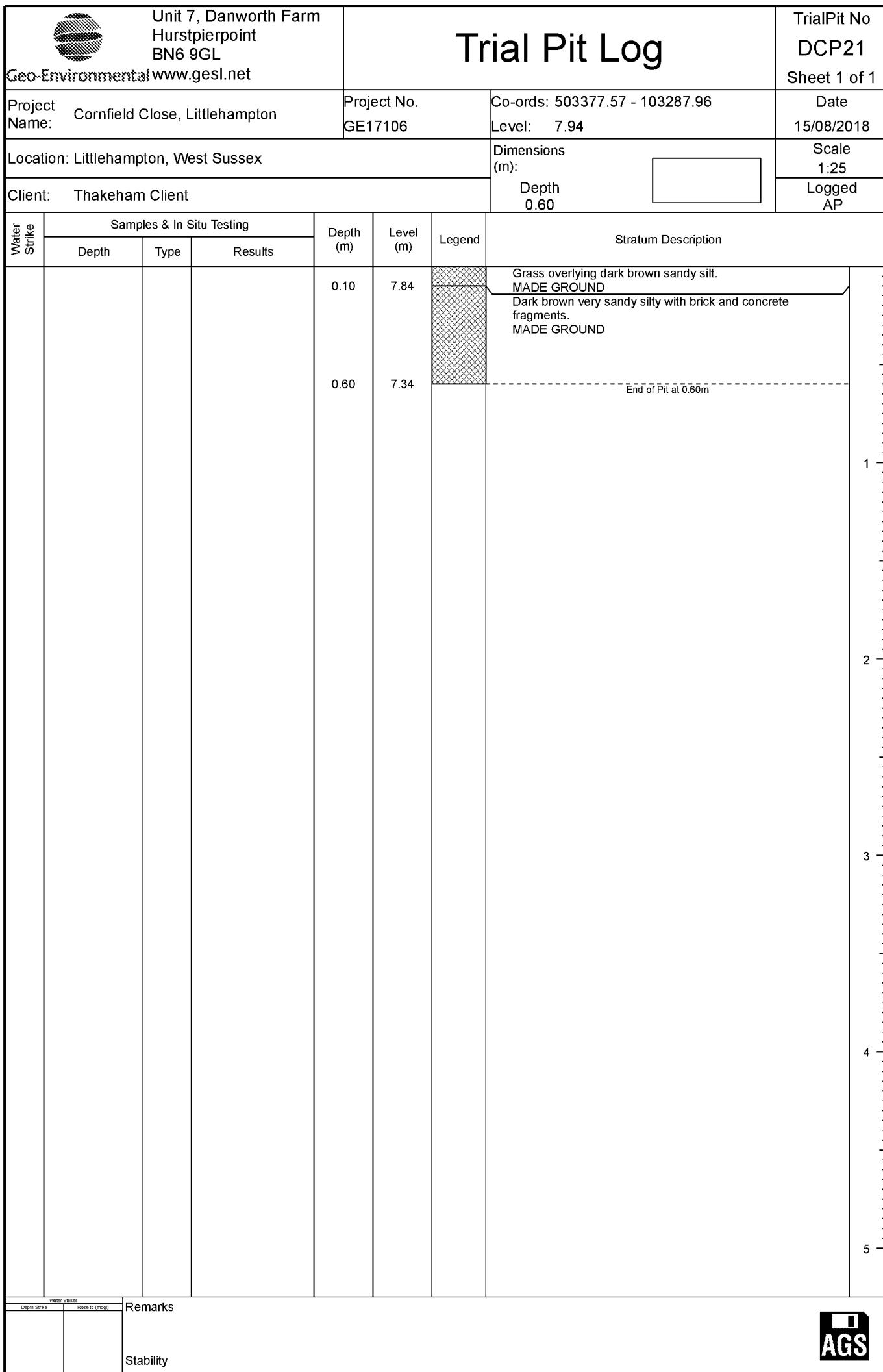
Depth
0.60

Logged
AP

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.15	7.94		Grass overlying dark brown sandy silt. MADE GROUND	
							Light brown very sandy silt with plastic, brick and concrete fragments. MADE GROUND	
				0.60	7.50		-----End of Pit at 0.60m-----	
								1
								2
								3
								4
								5
Water Strike		Remarks						
Depth Strike								
		Stability						









Unit 7, Danworth Farm
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Trial Pit Log

Trial Pit No

DCP24

Sheet 1 of 1

Project Name: Cornfield Close, Littlehampton

Project No.
GE17106

Co-ords: 503416.89 - 103280.00
Level: 8.25

Date
15/08/2018

Location: Littlehampton, West Sussex

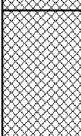
Dimensions
(m):

Scale
1:25

Client: Thakeham Client

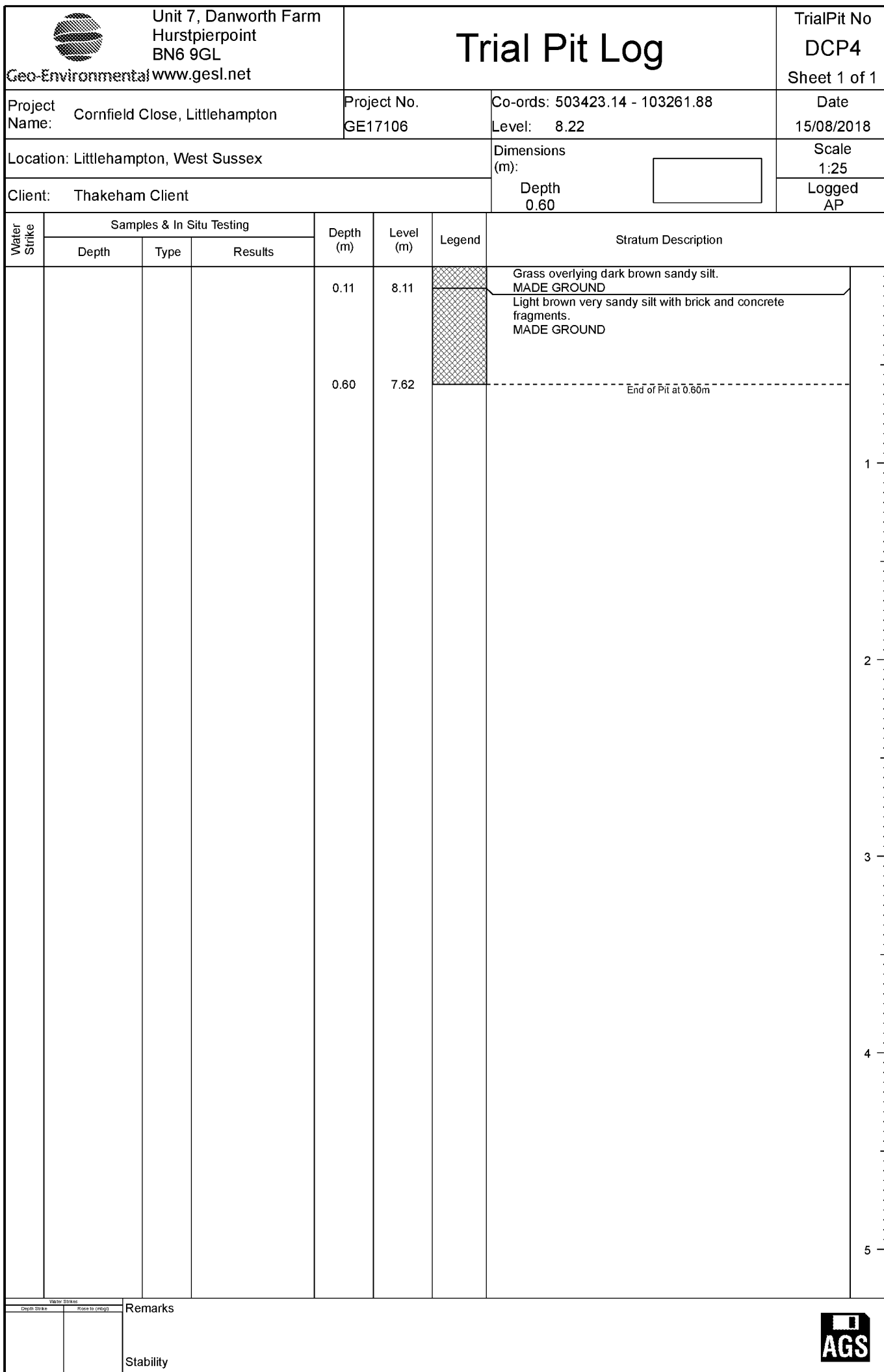
Depth
0.60

Logged
AP

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.17	8.08		Grass overlying dark brown sandy silt. MADE GROUND	
							Dark brown very sandy silt with brick and concrete fragments. MADE GROUND	
				0.60	7.65			-----End of Pit at 0.60m-----
								1 -
								2 -
								3 -
								4 -
								5 -
Water Strike		Remarks						
Depth Strike								
		Stability						









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Trial Pit Log

Trial Pit No

DCP6

Sheet 1 of 1

Project Name: Cornfield Close, Littlehampton

Project No.
GE17106

Co-ords: 503404.45 - 103221.09
Level: 7.84

Date
15/08/2018

Location: Littlehampton, West Sussex

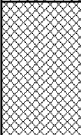
Dimensions
(m):

Scale
1:25

Client: Thakeham Client

Depth
0.60

Logged
AP

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.15	7.69		Grass overlying dark brown sandy silt. MADE GROUND	
							Light brown very sandy silt with brick and concrete fragments. MADE GROUND	
				0.60	7.24		End of Pit at 0.60m	
								1
								2
								3
								4
								5
Water Strike		Remarks						
Depth Strike		Stability						





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Trial Pit Log

Trial Pit No

DCP7

Sheet 1 of 1

Project Name: Cornfield Close, Littlehampton

Project No.
GE17106

Co-ords: 503418.01 - 103200.40
Level: 7.56

Date
15/08/2018

Location: Littlehampton, West Sussex

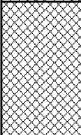
Dimensions
(m):

Scale
1:25

Client: Thakeham Client

Depth
0.60

Logged
AP

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.15	7.41		Grass overlying dark brown sandy silt. MADE GROUND	
							Light brown very sandy silt with brick and concrete fragments. MADE GROUND	
				0.60	6.96		End of Pit at 0.60m	
								1
								2
								3
								4
								5
Water Strike		Remarks						
Depth Strike		Stability						





Unit 7, Danworth Farm
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Trial Pit Log

Trial Pit No

TP101

Sheet 1 of 1

Project Name: Cornfield Close, Littlehampton

Project No.
GE17106

Co-ords: 503457.00 - 103291.00
Level:

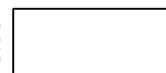
Date
12/04/2018

Location: Littlehampton, West Sussex

Dimensions (m): 2.40

Depth
2.90

0.50



Scale
1:25

Logged
WH

Client: Thakeham Client

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.70			Turf over soft brown slightly sandy slightly gravelly silt with abundant rootlets (to 0.2m). Gravel is fine to coarse fragments of flint, brick, glass, nail, concrete, and tiles MADE GROUND	
				1.50			LANDFILL: Dark brown to black including sand, fragments of brick and concrete, metal, fabric, glass bottles and plastic. With frequent roots. MADE GROUND	1
				2.40			Brownish yellow slightly silty gravelly SAND. Gravel is fine to medium rounded to sub-angular flint. RIVER TERRACE DEPOSITS	2
				2.90			Soft to firm brownish yellow and orange mottled slightly gravelly sandy CLAY. Gravel is fine to medium rounded to sub-angular flint. RIVER TERRACE DEPOSITS	
							End of Pit at 2.90m	3
								4
								5
Water Strike								
Depth Strike								
		Remarks	Groundwater not encountered. Soakage test carried out within natural material.					
		Stability	Unstable within the landfill					





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Trial Pit Log

Trial Pit No

TP102

Sheet 1 of 1

Project Name: Cornfield Close, Littlehampton

Project No.
GE17106

Co-ords: 503422.00 - 103179.00
Level:

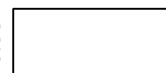
Date
12/04/2018

Location: Littlehampton, West Sussex

Dimensions (m): 2.30

Depth
3.00

0.50



Scale
1:25

Logged
WH

Client: Thakeham Client

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.25			Turf over brown slightly sandy gravelly silt. Gravel is fine to coarse fragments of flint, brick, glass, and concrete. MADE GROUND	
							LANDFILL: Dark brown to black including sand, fragments of brick and concrete, metal, fabric, glass bottles, plastic and wood. With occasional roots. MADE GROUND	1
				2.10				
							Soft orangeish brown and grey mottled sandy fissured CLAY with occasional red staining. RIVER TERRACE DEPOSITS	2
				3.00				
							End of Pit at 3.00m	3
								4
								5
Water Strike		Remarks		Groundwater not encountered. Soakage test carried out within natural material.				
Depth Strike		Stability		Unstable within the landfill				



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Unit 7, Danworth Farm
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Trial Pit Log

Trial Pit No

TP201

Sheet 1 of 1

Project Name: Cornfield Close, Littlehampton

Project No.
GE17106

Co-ords: 503390.54 - 103230.52
Level: 7.91

Date
13/08/2018

Location: Littlehampton, West Sussex

Dimensions
(m):

Scale
1:25

Client: Thakeham Client

Depth
4.40

Logged
AP

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.12	7.79		Grass overlying dark brown slightly sandy clayey silt. MADE GROUND	
							Brown slightly clayey sandy silt with brick and concrete fragments. MADE GROUND	
				0.70	7.21		Dark brown clayey silty sand with frequent glass, occasional timber, fabric, brick, concrete, plastic and metal cable. MADE GROUND	1
	1.80 1.80	B ES						2
				2.70	5.21		Orange brown very sandy friable CLAY. RIVER TERRACE DEPOSITS	3
				3.90	4.01		Dark yellow and orange brown SAND with occasional fine to coarse sub-rounded flint gravel. RIVER TERRACE DEPOSITS	4
				4.40	3.51		End of Pit at 4.40m	5
Water Strike								
Depth Strike								
		Remarks Groundwater not encountered, backfilled with arisings.						
		Stability						





Unit 7, Danworth Farm
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Trial Pit Log

Trial Pit No

TP202

Sheet 1 of 1

Project Name: Cornfield Close, Littlehampton

Project No.
GE17106

Co-ords: 503345.75 - 103268.46
Level: 8.16

Date
13/08/2018

Location: Littlehampton, West Sussex

Dimensions
(m):

Scale
1:25

Client: Thakeham Client

Depth
2.20

Logged

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	ES		0.15	8.01		Dark grey-brown slightly fine sandy silt with rare fine brick gravel. MADE GROUND	
	0.50	ES					Light brown slightly fine sandy silt with scattered brick cobbles. MADE GROUND	
	1.00	ES		0.70	7.46		Dark grey-brown and red-brown silty sandy clay with abundant glass bottles, rubber, metal, paper, brick, plastic. MADE GROUND	1
	1.50	ES						
				1.70	6.46		Firm grey-brown slightly fine sandy silty CLAY RIVER TERRACE DEPOSITS	2
	2.00	ES		2.20	5.96			
							End of Pit at 2.20m	
								3
								4
								5
Water Strike		Remarks		Groundwater not encountered, backfilled with arisings.				
Depth Strike		Stability						





Unit 7, Danworth Farm
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Geo-Environmental/ www.gesl.net

Trial Pit Log

Trial Pit No

TP203

Sheet 1 of 1

Project Name: Cornfield Close, Littlehampton

Project No.
GE17106

Co-ords: 503414.27 - 103301.30
Level: 8.09

Date
14/08/2018

Location: Littlehampton, West Sussex

Dimensions
(m):

Scale
1:25

Client: Thakeham Client

Depth
2.00

Logged

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	ES		0.15	7.94		Light brown slightly fine sandy silt with scattered brick cobbles. MADE GROUND	
	0.50	ES					Light grey brown medium sand with rare fine brick gravel. MADE GROUND	
	1.00	ES		0.80	7.29		Grey-brown and red-brown silty sandy clay with abundant brick and concrete rubble and scattered glass and ceramic fragments. MADE GROUND	1
	1.50	ES						
	2.00	ES		1.90 2.00	6.19 6.09		Firm dark grey-brown slightly fine sandy silty CLAY. RIVER TERRACE DEPOSITS	2
							End of Pit at 2.00m	
								3
								4
								5
Water Strike		Remarks		Groundwater not encountered, backfilled with arisings.				
Depth Strike		Stability						





Unit 7, Danworth Farm
Hurstpierpoint
BN6 9GL

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Trial Pit Log

Trial Pit No

TP204

Sheet 1 of 1

Project Name: Cornfield Close, Littlehampton

Project No.
GE17106

Co-ords: 503454.67 - 103284.95
Level: 7.74

Date
14/08/2018

Location: Littlehampton, West Sussex

Dimensions
(m):

Scale
1:25

Client: Thakeham Client

Depth
2.00

Logged
AP

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	ES		0.20	7.54		Grass overlying dark brown slightly sandy clayey silt. MADE GROUND	
	0.50	ES					Dark grey and dark brown clayey silty sand with plastic, brick, fabric, bones, timber and metal. MADE GROUND	
	1.00	ES						1
	1.50	ES						
	2.00	ES		1.80	5.94		Orange brown sandy silty CLAY. RIVER TERRACE DEPOSITS	2
				2.20	5.54		End of Pit at 2.00m	
								3
								4
								5
Water Strike								
Depth Strike								
		Remarks	Groundwater not encountered, backfilled with arisings.					
		Stability						





Unit 7, Danworth Farm
Hurstpierpoint
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Trial Pit Log

Trial Pit No

TP205

Sheet 1 of 1

Project Name: Cornfield Close, Littlehampton

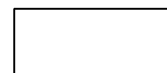
Project No.
GE17106

Co-ords: 503404.75 - 103259.25
Level: 8.19

Date
14/08/2018

Location: Littlehampton, West Sussex

Dimensions
(m):



Scale
1:25

Client: Thakeham Client

Depth
4.60

Logged
AP

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.15	8.04		Grass overlying dark brown slightly sandy clayey silt. MADE GROUND	
	0.50	ES		0.65	7.54		Brown sandy silt/silty sand with frequent brick and concrete fragments and rare pieces of metal. MADE GROUND	
	1.00	ES					Dark grey, black and dark brown clayey sand, sandy clay with frequent ash and glass and occasional plastic, metal, clay tile, brick, concrete, fabric and sandy clay bands. MADE GROUND	1
	1.50	ES						
	2.00	ES		2.10	6.08		Dark grey friable sandy clay with a slight organic malodour. MADE GROUND	2
	2.50	ES		2.70	5.48		Orange brown very sandy CLAY. RIVER TERRACE DEPOSITS	3
	3.00	ES						
				4.40	3.78		Orange brown medium SAND. RIVER TERRACE DEPOSITS	4
				4.60	3.58		End of Pit at 4.60m	5
Water Strike								
Depth Strike								
		Remarks	Groundwater not encountered, backfilled with arisings.					
		Stability						





Unit 7, Danworth Farm
Hurstpierpoint
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Trial Pit Log

Trial Pit No

TP206

Sheet 1 of 1

Project Name: Cornfield Close, Littlehampton

Project No.
GE17106

Co-ords: 503410.61 - 103171.35
Level: 7.34

Date
14/08/2018

Location: Littlehampton, West Sussex

Dimensions
(m):

Scale
1:25

Client: Thakeham Client

Depth
2.20

Logged
AP

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	ES		0.20	7.14		Grass overlying brown silty clayey sand with occasional brick fragments. MADE GROUND	
	0.50	ES					Dark brown and dark grey clayey silty sand with frequent glass, plastic bags, brick, fabric, bones, timber and metal. MADE GROUND	
	1.00	ES						1
	1.50	ES						
	2.00	ES		1.80	5.54		Orange brown sandy silty CLAY. RIVER TERRACE DEPOSITS	2
				2.20	5.14		End of Pit at 2.20m	
								3
								4
								5
Water Strike								
Depth Strike								
		Remarks Groundwater not encountered, backfilled with arisings.						
		Stability						





Unit 7, Danworth Farm
Hurstpierpoint
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Trial Pit Log

Trial Pit No

TP207

Sheet 1 of 1

Project Name: Cornfield Close, Littlehampton

Project No.
GE17106

Co-ords: 503351.83 - 103180.74
Level: 8.04

Date
14/08/2018

Location: Littlehampton, West Sussex

Dimensions
(m):

Scale
1:25

Client: Thakeham Client

Depth
2.20

Logged
AP

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10			0.10	7.94		Grass overlying dark brown slightly sandy clayey silt. MADE GROUND	
	0.20	ES					Brown slightly clayey, sandy silt with frequent brick, concrete and flint gravel, rare tarmacadam and roots (<5mm diameter). MADE GROUND	
	0.50	ES		0.60	7.44			
	1.00	ES					Brown, dark brown and dark grey slightly clayey very silty sand with frequent glass, plastic, concrete, brick and ash. MADE GROUND	1
	1.50	ES						
	2.00	ES		2.00	6.04		Dark grey brown slightly clayey, sandy silt. MADE GROUND	2
				2.20	5.84		End of Pit at 2.20m	
								3
								4
								5
Water Strike								
Depth Strike								
		Remarks Groundwater not encountered, backfilled with arisings.						
		Stability						





Unit 7, Danworth Farm
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Trial Pit Log

Trial Pit No

TP208

Sheet 1 of 1

Project Name: Cornfield Close, Littlehampton

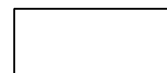
Project No.
GE17106

Co-ords: 503313.94 - 103187.17
Level: 8.20

Date
14/08/2018

Location: Littlehampton, West Sussex

Dimensions
(m):



Scale
1:25

Client: Thakeham Client

Depth
2.30

Logged
AP

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	ES		0.15	8.05		Grass overlying dark brown slightly sandy clayey silt. MADE GROUND	
	0.50	ES					Light brown slightly clayey sandy silt with occasional brick and concrete fragments. MADE GROUND	
	1.00	ES		0.80	7.40		Dark brown and dark grey silty sand and sandy clay with abundant glass, occasional plastic, concrete, brick, china, ash and rope. MADE GROUND	1
	1.50 1.50	B ES						
	2.00	ES		2.00	6.20		Orange brown friable sandy CLAY. RIVER TERRACE DEPOSITS	2
				2.30	5.90		End of Pit at 2.30m	
								3
								4
								5
Water Strike								
Depth Strike								
		Remarks Groundwater not encountered, backfilled with arisings.						
		Stability						



Trial Pit Log

Project Name: Cornfield Close, Littlehampton

Project No.
GE17106

Co-ords: 503393.87 - 103262.44
Level: 8.36

Date
14/08/2018

Location: Littlehampton, West Sussex

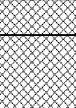
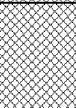
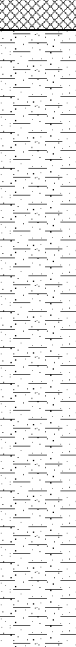
Dimensions

Scale
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Client: Thakeham Client

Depth
4.50

Logged
AP

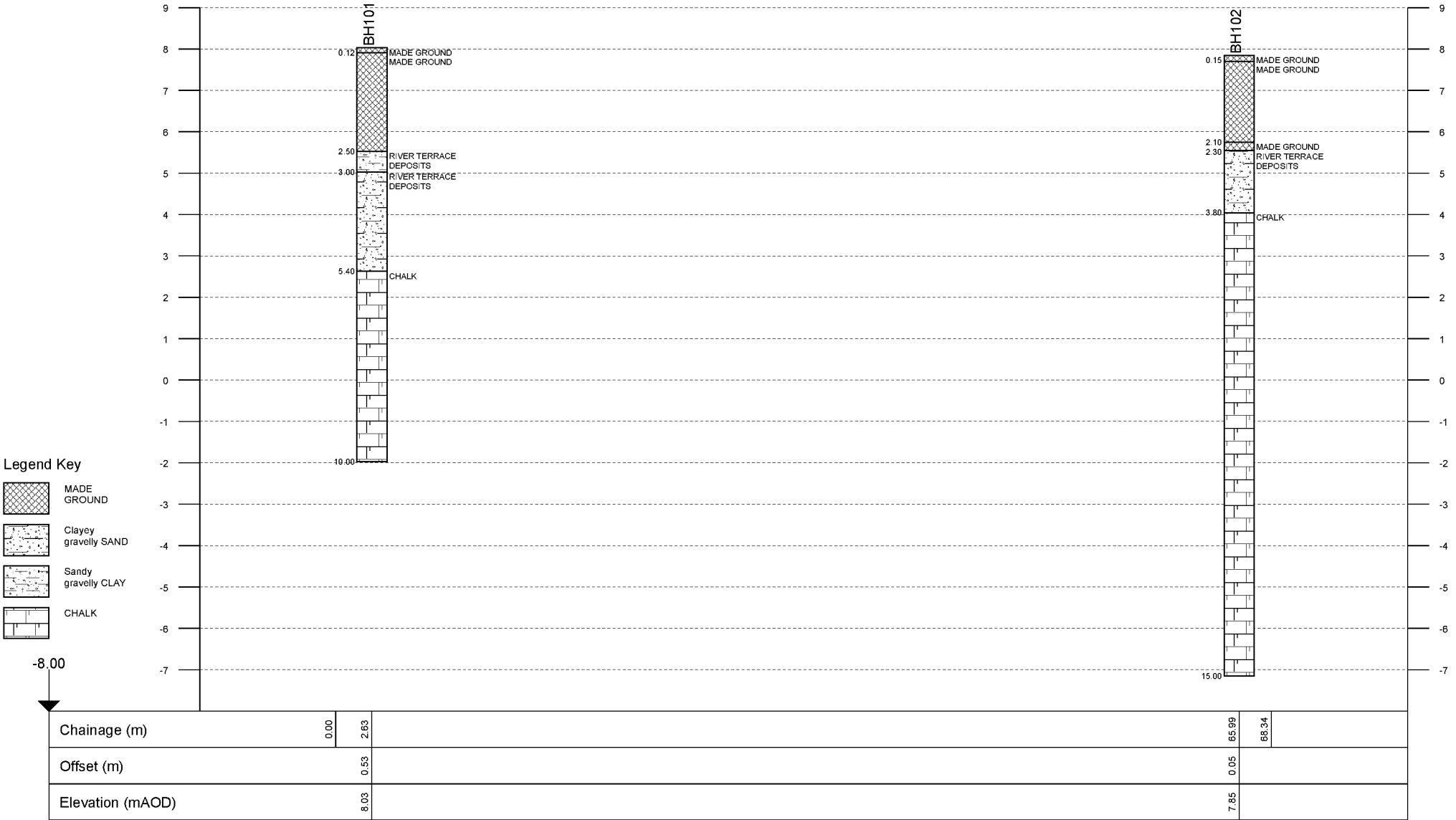
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description				
	Depth	Type	Results								
	1.50 1.50	B ES		0.12	8.24		Grass overlying dark brown slightly sandy clayey silt. MADE GROUND	1 -			
							Light brown very sandy silt with frequent fine to coarse sub-rounded flint gravel, rare brick, concrete and plastic. MADE GROUND				
				1.02	7.34		Dark brown, dark grey silty sand with abundant ash, frequent glass, occasional fabric, plastic, rare metal, paper and rubber. MADE GROUND	2 -			
				2.12	6.24		Orange brown sandy CLAY. RIVER TERRACE DEPOSITS				
				4.20	4.16		Dark yellow and orange brown SAND with occasional fine to coarse sub-rounded flint gravel. RIVER TERRACE DEPOSITS	3 -			
				4.40	3.96		Light brown slightly chalky SAND. RIVER TERRACE DEPOSITS				
				4.50	3.86		Light brown slightly chalky SAND. RIVER TERRACE DEPOSITS				
				End of Pit at 4.50m							5 -

Water Strike		Remarks
Depth Strike	Notes to (m) (g)	
		Groundwater not encountered, backfilled with arisings.
		Stability



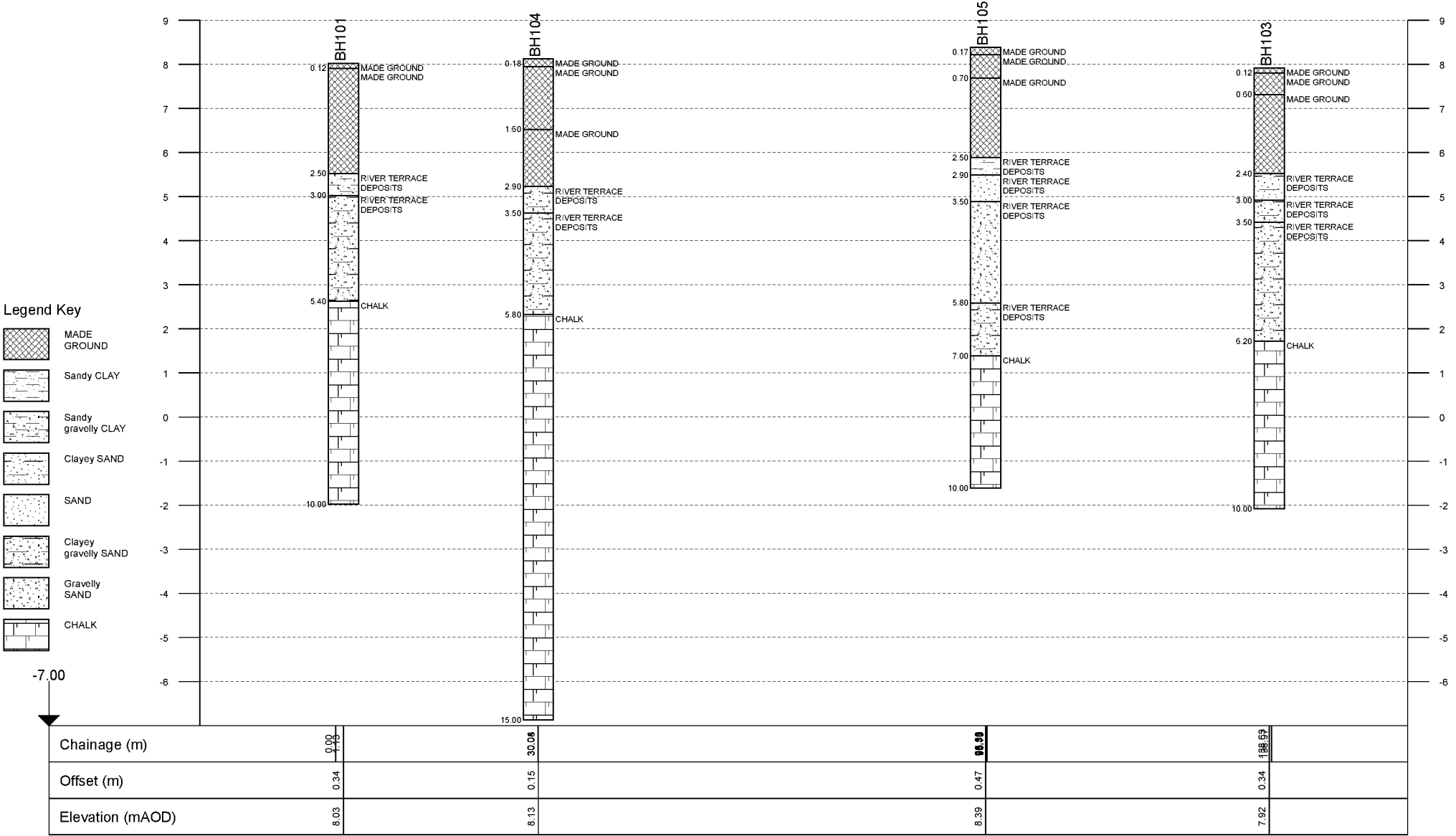
Project Id: GE17106
Project Title: Cornfield Close, Littlehampton
Location: Littlehampton, West Sussex
Client: Thakeham Client

Title: Section line 1
Vertical Scale: 1:131
Horizontal Scale: 1:396
Engineer: Anthony



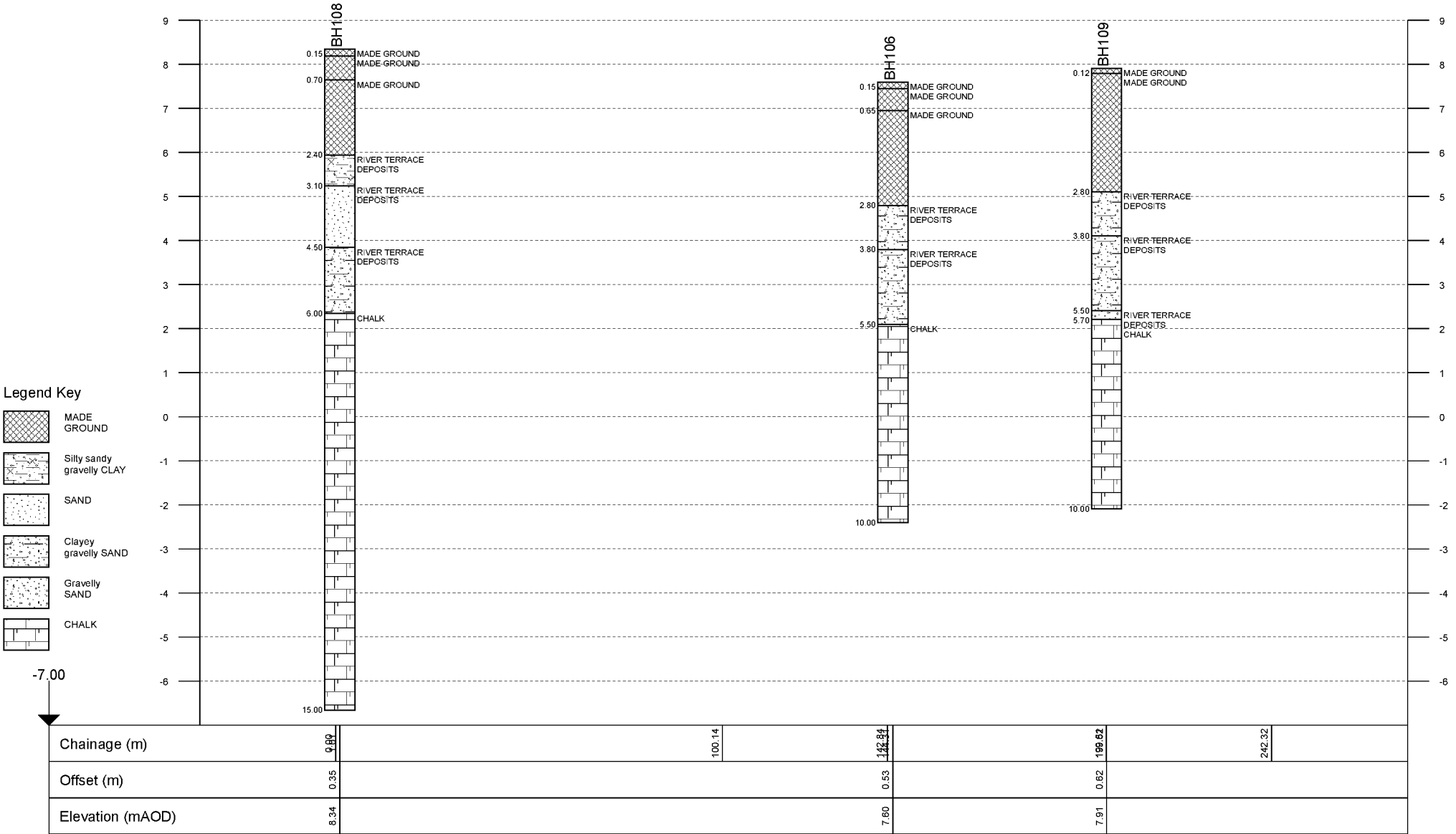
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Location: Littlehampton, West Sussex
Client: Thakeham Client

Title: Section line 2
Vertical Scale: 1:123
Horizontal Scale: 1:805
Engineer: Anthony



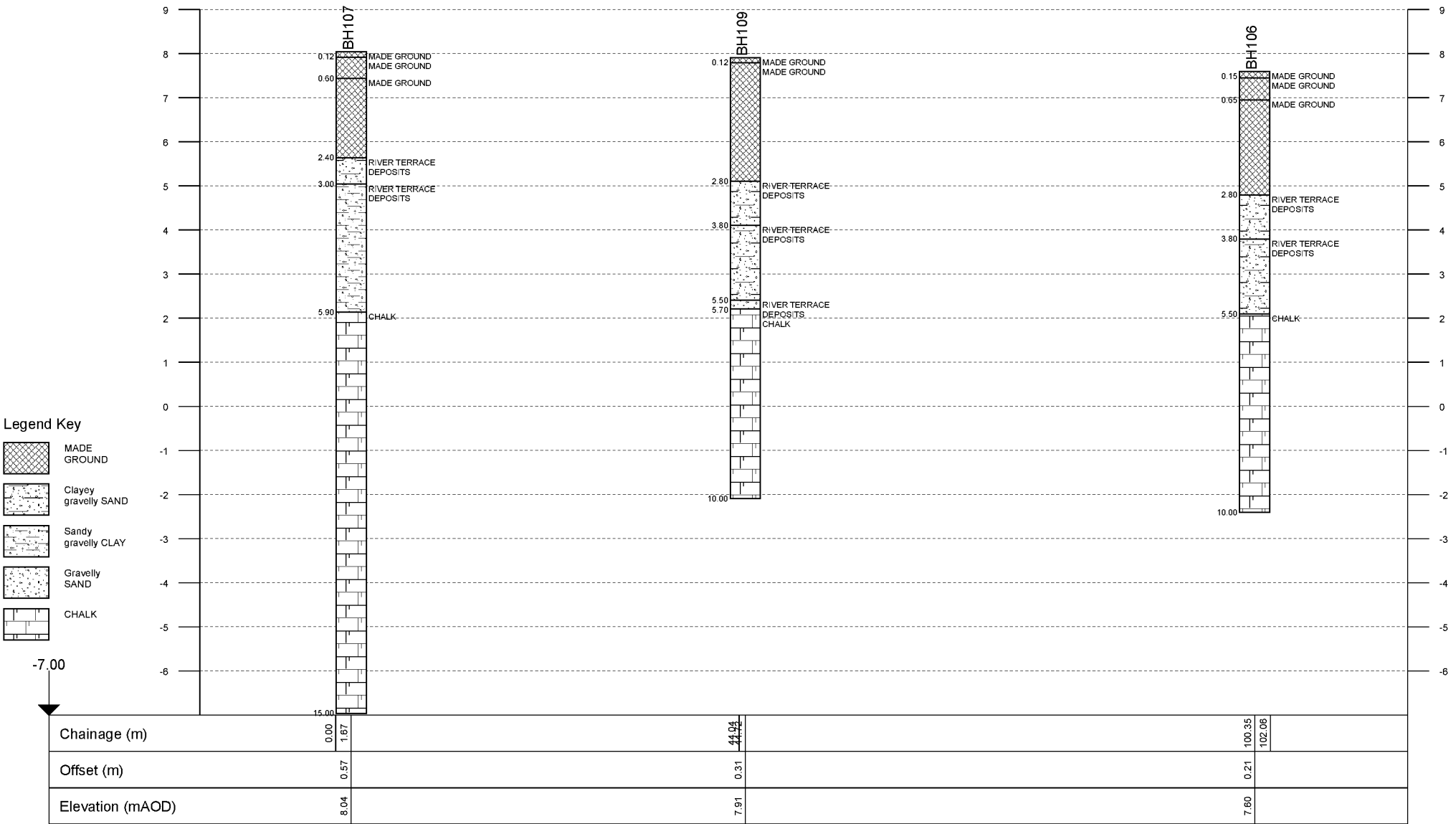
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Project Title: Cornfield Close, Littlehampton
Location: Littlehampton, West Sussex
Client: Thakeham Client

Title: Section line 3
Vertical Scale: 1:123
Horizontal Scale: 1:1404
Engineer: Anthony



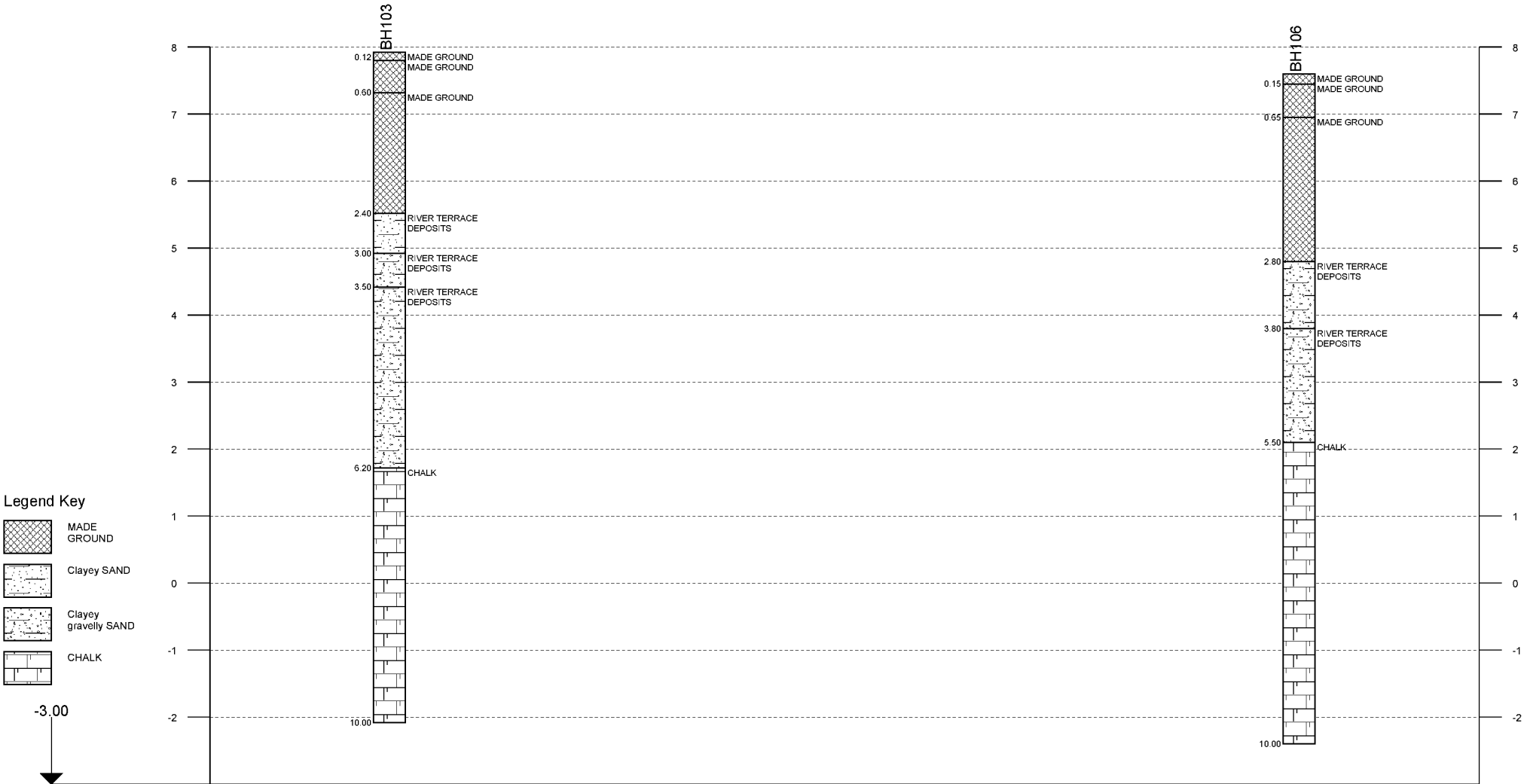
Project Id: GE17106
Project Title: Cornfield Close, Littlehampton
Location: Littlehampton, West Sussex
Client: Thakeham Client

Title: Section line 3
Vertical Scale: 1:123
Horizontal Scale: 1:592
Engineer: Anthony



Project Id: GE17106
Project Title: Cornfield Close, Littlehampton
Location: Littlehampton, West Sussex
Client: Thakeham Client

Title: Section line 3
Vertical Scale: 1:85
Horizontal Scale: 1:316
Engineer: Anthony



Chainage (m)	0.00	2.02	52.48	54.50
Offset (m)		0.13	0.13	
Elevation (mAOD)	7.92		7.60	

Project Id: GE17106
Project Title: Cornfield Close, Littlehampton
Location: Littlehampton, West Sussex
Client: Thakeham Client

Title: Section line 4
Vertical Scale: 1:123
Horizontal Scale: 1:562
Engineer: Anthony



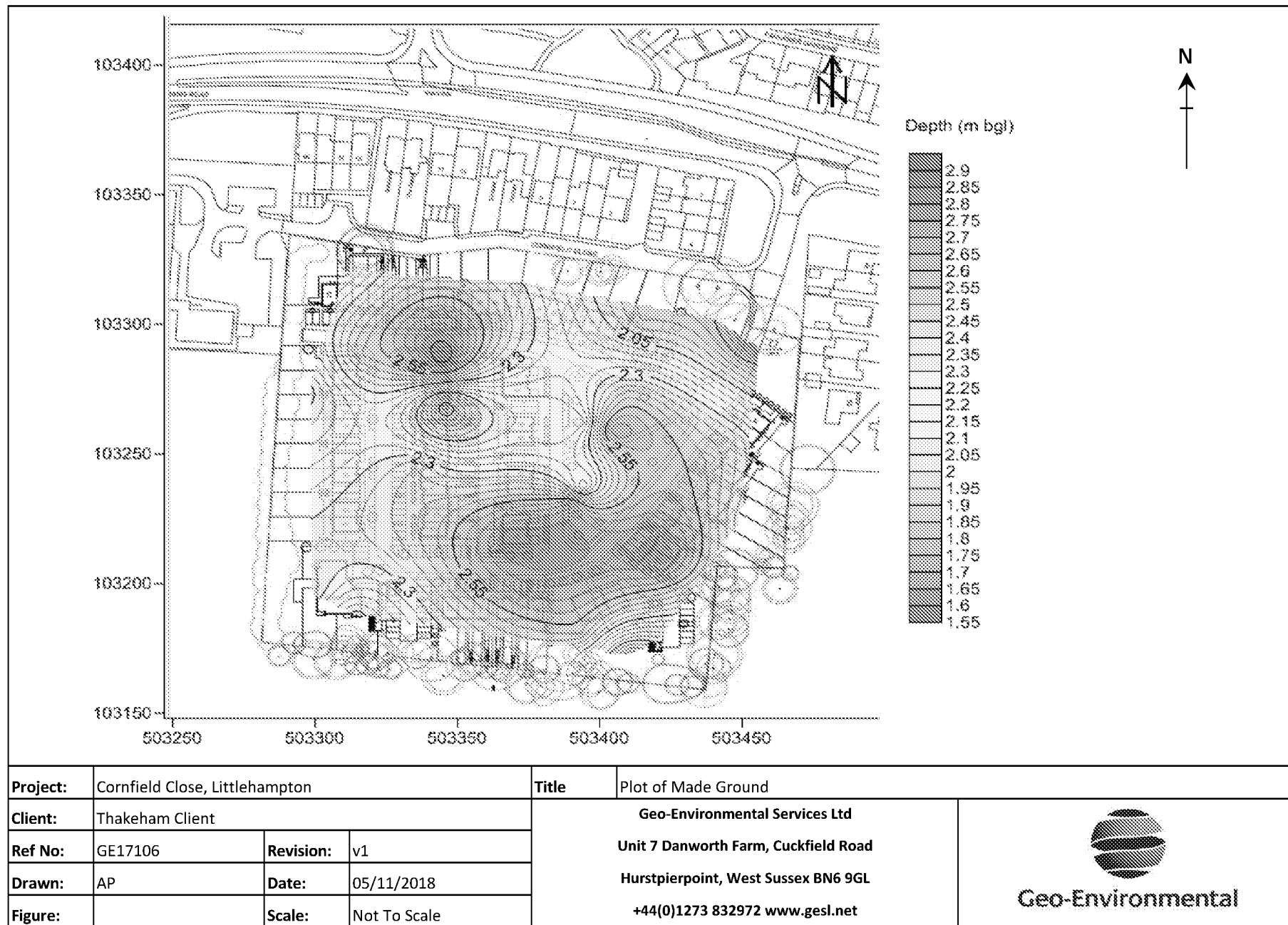
Legend Key

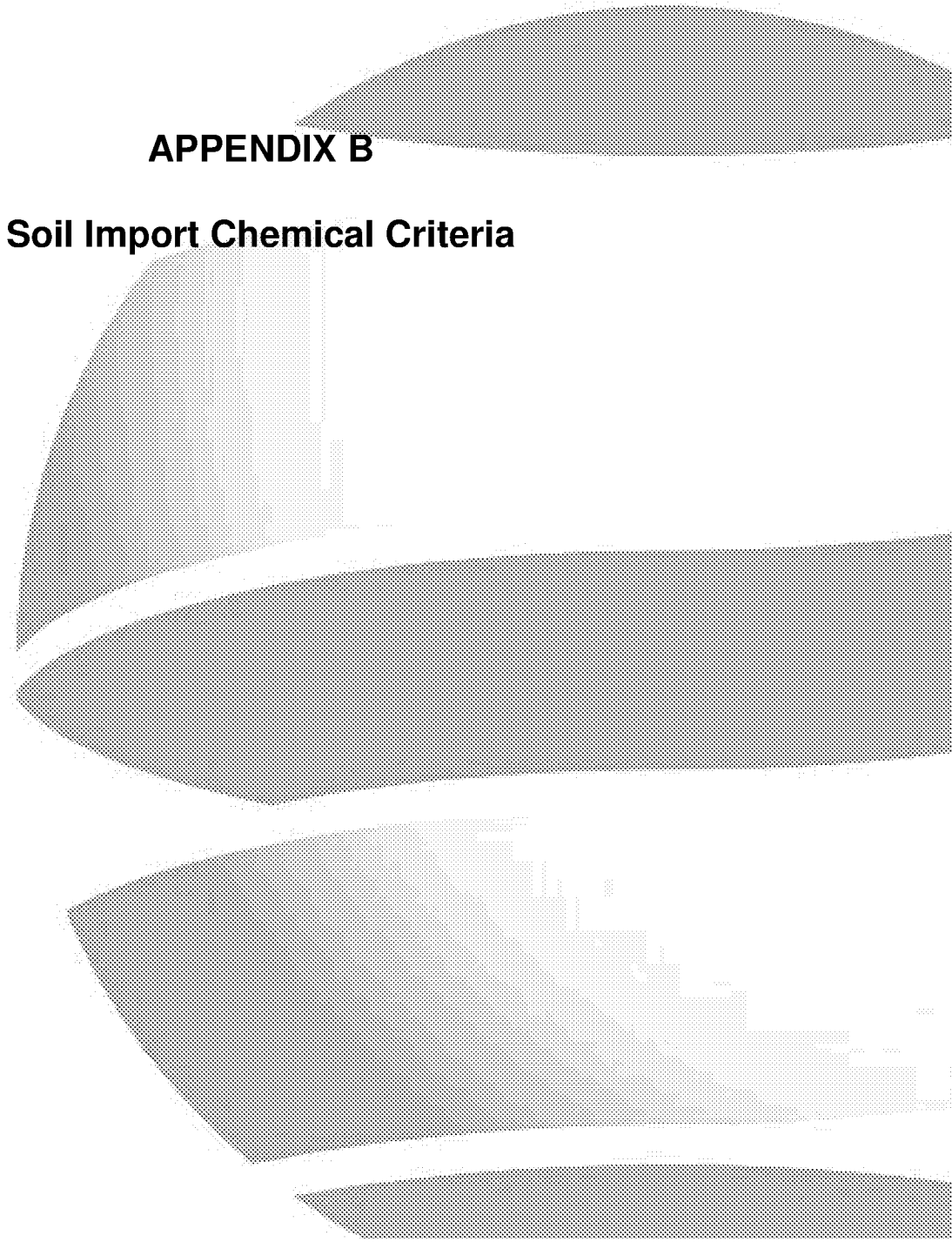
- MADE GROUND
- Silly sandy gravelly CLAY
- Sandy gravelly CLAY
- SAND
- Clayey gravelly SAND
- CHALK

-7.00



Chainage (m)	0.00	2.05	95.91	96.93
Offset (m)		0.26	0.38	
Elevation (mAOD)	8.03		8.34	





APPENDIX B

Soil Import Chemical Criteria



Geo-Environmental

IMPORTED SOIL SPECIFICATION

for the site at

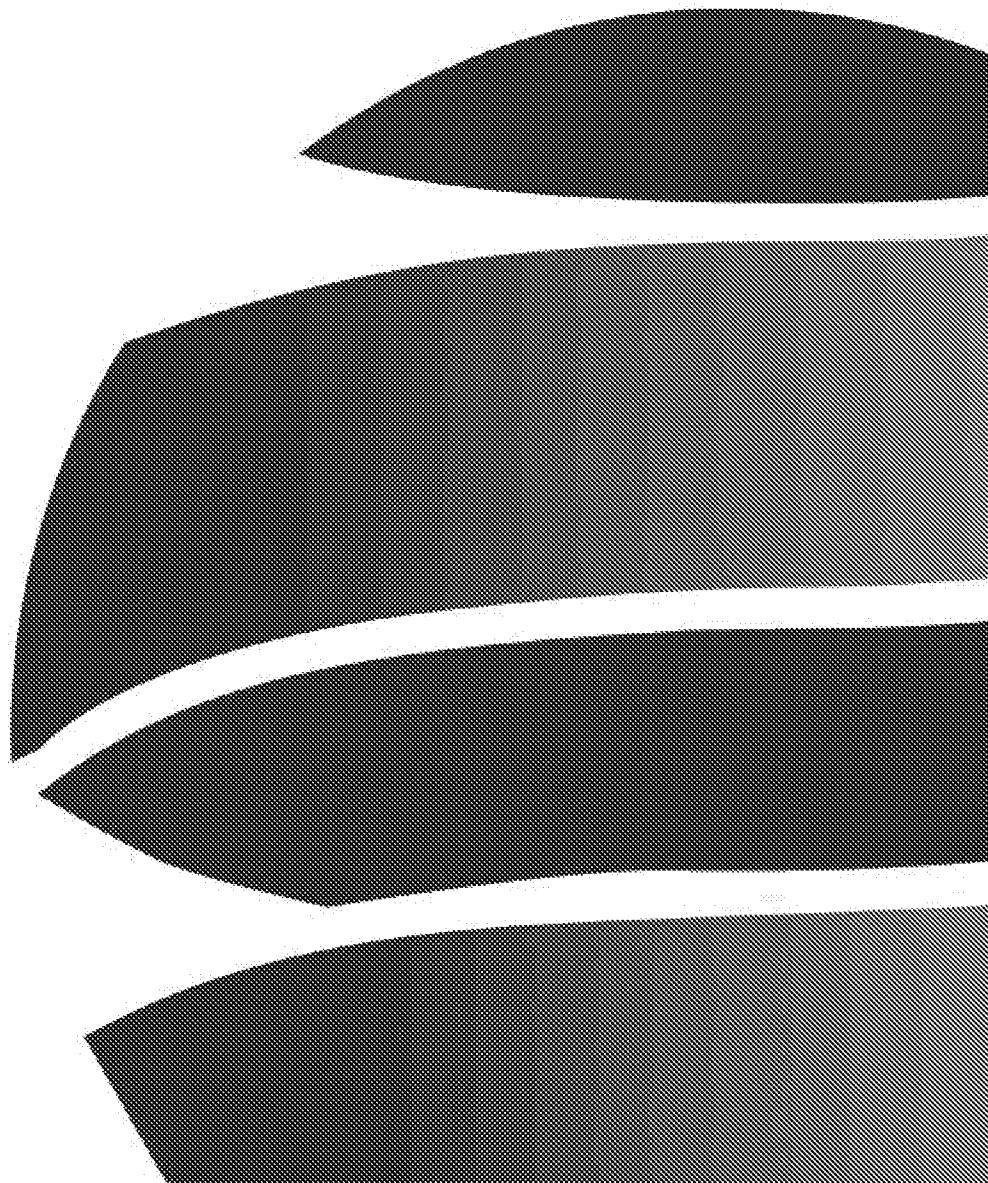
FORMER DAISYFIELDS CARAVAN PARK

CORNFIELD CLOSE, LITTLEHAMPTON

WEST SUSSEX, BN17 6LD

on behalf of

THAKEHAM CLIENT LIMITED





CONTENTS

1.0	Introduction	1
2.0	Chemical Composition	1
3.0	Nutritional Composition	5
4.0	Physical Composition	5
5.0	Source Requirements	6
6.0	Testing Rates and Compliance	6



1.0 Introduction

This document sets out the requirements for imported subsoil and Topsoil materials for any project undergoing redevelopment or other works where capping work is required.

Within the specification reference has been made to topsoil and subsoil. Topsoil relates to the top layer of natural soil that can support healthy vegetation growth. Subsoil relates to the layer of soil immediately below the topsoil to the depth of the underlying broken rock or geological parent material.

The specification considers the chemical, nutritional and physical properties of soils that are to be imported onto site, in order to ensure materials used are suitable for their intended use and do not introduce any new hazard or pollutant linkage on to the site.

Where there is any discrepancy between this specification and BS3882:2015 or BS8601:2013, the latter documents shall take precedence unless otherwise formally confirmed by the relevant regulator.

2.0 Chemical Composition

The chemical criteria listed below are based on published CLEA Soil Guideline Values (SGVs), generic assessment criteria calculated using UK policy compliant software or by reference to current guidance and best practice. From time to time these values may change in line with regulatory or UK policy changes. Such changes will require revision and re-issue of this document.

At the time of preparation, where SGVs have not been published, generic assessment criteria (GAC) have been generated using the Contaminated Land Exposure Assessment (CLEA) model v1.06 published by the Environment Agency, or the Category 4 Screening Levels (C4SLs) published by DEFRA have been used. Although the C4SLs were released for Part 2A use, the associated policy companion document for the C4SLs indicated that they may also be used for planning. Although the C4SLs represent a marginally higher risk level than the SSACs (low risk rather than minimal risk) it is considered that the risk levels remain very low. Therefore, the final C4SLs are considered to be suitable to assess soils under the planning regime. Where SGVs or GAC are published for a range of Soil Organic Matter (SOM) values, these ranges and their respective SOM values have been presented and would be considered when assessing compliance with this Specification.

2.1 Method of Analysis

Samples should be analysed using UKAS or MCERTS accredited laboratories. For TPH analysis sample preparation must not include air drying.

2.1.1 Poly Aromatic Hydrocarbon (PAH)

The PAH analysis must include the EPA priority 16.

2.1.2 Total Petroleum Hydrocarbons (TPH)

The analysis for TPH should be undertaken on the 'as received' sample and not be subject to any pre-treatment and include aliphatic and aromatic carbon banding split.



2.2 Topsoil (0-300mm depth)

Table 1 provides a list of the maximum acceptable concentrations for imported topsoil.

Parameter	Maximum concentration (mg/kg)
Inorganic	
Arsenic (total)	<32
Boron (water soluble)	<291
Cadmium (total)	10 (SOM=6%)
Chromium (total)	<130
Copper (total)	<2330
Cyanide (total)	<250
Lead (total)	<200
Mercury (total inorganic)	<8
Nickel (total)	<130 (SOM=6%)
pH	5.5 – 7.8
Selenium (total)	<350 (SOM=6%)
Sulphate (total)	<2000
Zinc (total)	<3750
Asbestos	Absent
Organic	
Soil Organic Matter (SOM)	
Phenols (total)	<420 (SOM=6%)
Poly Aromatic Hydrocarbon (speciated)	See Table 1a
Total Petroleum Hydrocarbon (speciated)	See Table 1b

Table 1 Chemical Specification for Topsoil

Determinant	Maximum Concentration (mg/kg)		
	1% SOM	2.5% SOM	5% SOM
Acenaphthene	210	480	1000
Acenaphthylene	170	400	850
Anthracene	2300	4900	9200
Benz(a)anthracene	3.1	4.7	5.9
Benzo(a)pyrene	0.83	0.94	1.0
Benzo(b)fluoranthene	5.6	6.5	7.0
Benzo(ghi)perylene	44	46	47
Benzo(k)fluoranthene	8.5	9.6	10
Chrysene	6.0	8.0	9.3
Dibenz(ah)anthracene	0.76	0.86	0.9
Fluoranthene	260	460	670
Fluorene	160	380	780
Indeno(1,2,3CD)pyrene	3.2	3.9	4.2
Naphthalene	1.5	3.7	8.7
Phenanthrene	92	200	380
Pyrene	560	1000	1600

Table 1a Topsoil Specification for Speciated PAH



Determinant	Maximum Concentration (mg/kg)		
	1% SOM	2.5% SOM	5% SOM
Aliphatic			
EC 5-6	30	55	110
EC >6-8	73	160	370
EC >8-10	19	46	110
EC >10-12	93	230	540
EC >12-16	740	1700	3000
EC >16-35	45000	64000	76000
EC >35-44	45000	64000	76000
Aromatic			
EC 5-7 (benzene)	65	130	280
EC >7-8 (toluene)	120	270	611
EC >8-10	27	65	151
EC >10-12	69	160	346
EC >12-16	140	310	593
EC >16-21	250	480	770
EC >21-35	890	1100	1230
EC >35-44	890	1100	1230
Aliphatic and Aromatic			
EC >44-70	1200	1300	1300

Table 1b Topsoil Specification for Speciated TPH

Determinant	Phytotoxicity GAC (mg/kg)		
	pH <6.0	pH 6.0-7.0	pH >7.0
Zinc	200	200	300
Copper	100	135	200
Nickel	60	75	110

Table 1c Topsoil Specification for phytotoxicity

2.3 Subsoil (300-1000mm depth)

Table 2 provides a list of the maximum acceptable concentrations for imported subsoil.

Parameter	Maximum concentration (mg/kg)
Inorganic	
Arsenic (total)	<32
Boron (water soluble)	<291
Cadmium (total)	10 (SOM=6%)
Chromium (total)	<130
Copper (total)	<2330
Cyanide (total)	<250
Lead (total)	<200
Mercury (total inorganic)	<8
Nickel (total)	<130 (SOM=6%)
pH	5.5 – 7.8



Parameter	Maximum concentration (mg/kg)
Inorganic	
Selenium (total)	<350 (SOM=6%)
Sulphate (total)	<2000
Zinc (total)	<3750
Asbestos	Absent
Organic	
Soil Organic Matter (SOM)	
Phenols (total)	<420 (SOM=6%)
Poly Aromatic Hydrocarbon (speciated)	See Table 1a
Total Petroleum Hydrocarbon (speciated)	See Table 1b

Table 2 Chemical Specification for Subsoil

Determinant	Maximum Concentration (mg/kg)		
	1% SOM	2.5% SOM	5% SOM
Acenaphthene	210	480	1000
Acenaphthylene	170	400	850
Anthracene	2300	4900	9200
Benz(a)anthracene	3.1	4.7	5.9
Benzo(a)pyrene	0.83	0.94	1.0
Benzo(b)fluoranthene	5.6	6.5	7.0
Benzo(ghi)perylene	44	46	47
Benzo(k)fluoranthene	8.5	9.6	10
Chrysene	6.0	8.0	9.3
Dibenz(ah)anthracene	0.76	0.86	0.9
Fluoranthene	260	460	670
Fluorene	160	380	780
Indeno(1,2,3CD)pyrene	3.2	3.9	4.2
Naphthalene	1.5	3.7	8.7
Phenanthrene	92	200	380
Pyrene	560	1000	1600

Table 2a Subsoil Specification for Speciated PAH

Determinant	Maximum Concentration (mg/kg)		
	1% SOM	2.5% SOM	5% SOM
Aliphatic			
EC 5-6	30	55	110
EC >6-8	73	160	370
EC >8-10	19	46	110
EC >10-12	93	230	540
EC >12-16	740	1700	3000
EC >16-35	45000	64000	76000
EC >35-44	45000	64000	76000
Aromatic			
EC 5-7 (benzene)	65	130	280



Determinant	Maximum Concentration (mg/kg)		
	1% SOM	2.5% SOM	5% SOM
EC >7-8 (toluene)	120	270	611
EC >8-10	27	65	151
EC >10-12	69	160	346
EC >12-16	140	310	593
EC >16-21	250	480	770
EC >21-35	890	1100	1230
EC >35-44	890	1100	1230
Aliphatic and Aromatic			
EC >44-70	1200	1300	1300

Table 2b Subsoil Specification for Speciated TPH

Determinant	Phytotoxicity GAC (mg/kg)		
	pH <6.0	pH 6.0-7.0	pH >7.0
Zinc	200	200	300
Copper	100	135	200
Nickel	60	75	110

Table 2c Subsoil Specification for phytotoxicity

3.0 Nutritional Composition

The nutritional criteria listed below are based on BS3882:2015 for topsoil and BS8601:2013 for subsoil. In the absence of published criteria, current guidance and best practice has been applied to derive appropriate criteria.

3.1 Topsoil & Subsoil

Table 3 details the minimum acceptable concentrations for imported topsoil and subsoil.

Topsoil/Subsoil	Parameter	Concentration
Topsoil	Phosphorous	16 – 140 mg/l
	Potassium	121 – 1500 mg/l
	Magnesium	51 – 600 mg/l
	Nitrogen	0.15 % m/m
	Carbon:nitrogen ratio	<20:1
Subsoil	Phosphorous	16 mg/l
	Potassium	121 mg/l
	Magnesium	51 mg/l
	Nitrogen	0.15 %
	Carbon:nitrogen ratio	<20:1

Table 3 Nutritional Specification for Topsoil and Subsoil

4.0 Physical Composition

The physical criteria listed below are based on BS 3882:1994 Specification for Topsoil. In the absence of published criteria, current guidance and best practice has been applied to derive appropriate criteria.



4.1 Topsoil

Table 4 details requirements for imported topsoil and subsoil.

Topsoil/Subsoil	Parameter	Specification requirements
Topsoil	Textural Classification	Sandy clay loam, sandy loam, loamy sand, sandy silt loam (as defined in BS 3882, Figure 1)
	Loss on Ignition	3 - 20% (for 5-20% clay soil) 5 -20% (for 20-35% clay soil)
	Maximum Stone content:	>2mm = 30% >20mm = 10% >50mm = 0%
Subsoil	Textural Classification	Refer to BS8601 Figure 1
	Loss on Ignition	2%
	Maximum Stone content:	>2mm = 40% >20mm = 20% >75mm = 0%

NB: Topsoil and Subsoil must be free from glass, brick fragments, asbestos and other deleterious materials.

Table 4 Physical Specification for Topsoil & Subsoil

5.0 Source Requirements

5.1 Topsoil and Subsoil

The following will be provided with all soils imported to site:

- Location of site which is clean and has no history of potentially contaminative uses.
- A site plan detailing the location and address of the source site.

5.2 Manufactured soils

Where natural soils are unavailable manufactured soils may be utilised the following should be provided:

- Details of the soil manufacturing process, including criteria for received soils, quality control procedure and validation protocol.
- Soils should be tested at a minimum ratio of one sample per 50m³.

6.0 Testing Rates and Compliance

Sampling shall be undertaken in accordance with BS3882:2015 and BS8601:2013.

6.1 Topsoil

Where natural sourcing is proposed, the provenance of the material shall be determined by confirmation of the source site's history to confirm no previous potentially contaminative use, coupled with analysis of soils at a minimum rate of 3No. samples per source site (up to 250m³) and 1 sample per 250m³ thereafter.

Where Topsoil is derived from a manufactured source, testing would be undertaken at a rate of 1 sample per 50m³.



With regards to physical and nutritional composition and minimum testing regime of 1 sample per 250m³ is recommended for either source.

6.2 Subsoil

Where the source of the material is known and a due diligence review has established no previous contaminative use associated with the proposed subsoil, validation sampling should be undertaken at a minimum rate of 3 sample per source (up to 250m³) and 1 sample per 250m³ thereafter.

Where the source of the material is not known the validation sampling should be undertaken at a minimum of 1 sample per 50m³.

6.3 Manufactured soils

Soils should be tested at a minimum ratio of one sample per 50m³.

6.4 Sample failure

In the event that a sample fails to meet the specified criteria for any parameter the Environmental Consultant should be contacted for advice on the suitability of the materials.

Further testing may be required to provide reassurance that the exceedances are not representative of the soil.

6.5 Timing

Sampling and analysis undertaken by a manufactured topsoil supplier shall be no earlier than two weeks from the date of import, any results which are older than two weeks will be deemed not to be representative of the soils to be imported and rejected. Results showing consistency of batching shall may be requested.

Imported soil suppliers and groundworks contractors are required to take reasonably practicable measures to ensure that compliance with this Specification does not hinder formal completion of individual plots or developments.

6.6 General Compliance

All analytical suites shall correspond with the chemical and nutritional compliance criteria (as set out in Tables 1 to 3). The soil supplier shall ensure that the analytical limits of detection are equal or lower than the compliance values presented within this Specification. Where either testing suites or limits of detection do not comply with this Specification, the entire set of results shall be rejected.