GROUND ENGINEERING LIMITED

Newark Road
Peterborough
PE1 5UA
Tel: 01733 566566
e: admin@groundengineering.co.uk

SITE INVESTIGATION REPORT

STATION YARD
MILL DROVE SOUTH
COWBIT
SPALDING
LINCOLNSHIRE

Report Reference C15840A

On behalf of:-

Holbeach Manor
Fleet Road
Holbeach
Lincolnshire
PE12 7AX

February 2023

SEAGATE HOMES

SITE INVESTIGATION REPORT

FOR

PROPOSED RESIDENTIAL DEVELOPMENT

AT

STATION YARD

MILL DROVE SOUTH

COWBIT

SPALDING

LINCOLNSHIRE

Report Reference No. C15840A **February 2023**

INTRODUCTION

The client, Seagate Homes, proposes to build a new residential development at Station Yard, off Mill Drove South, Cowbit near Spalding in Lincolnshire.

Ground Engineering Limited was commissioned by the client to carry out a site investigation to determine the nature and geotechnical properties of the underlying soils, and provide information for the design and construction of the foundations. A desk study checking past uses had previously been undertaken by Ground Engineering Limited for the client, report referenced C15840 dated December 2022, and extracts are included within this report.

LOCATION, TOPOGRAPHY AND GEOLOGY OF THE SITE

The site lies on the northern side of the Lincolnshire village of Cowbit, as shown on the site location plan, and is situated about 5km to the south of Spalding. The site is centred at National Grid Reference TF 2653 1818.

The site comprises a 40m wide by 160m long plot of derelict land, former railway sidings, located to the north of Stone Gate, and to the west of Mill Drove South. A dirt track runs along the western side of the site, which was generally overgrown with grass, brambles, bushes, and Silver Birch and Hawthorn saplings. Centrally within the southern half of the site was a double height brick constructed building, believed to have been a goods or engine shed. A strip of asphalt hardstanding runs around the former engine shed and along the eastern side of the site. There were some mounds of fly-tipped materials including soil, construction rubble, wood and timber scattered across the site. Trees around the site included Lombardy Poplar, Silver Birch and Leyland Cypress.

The fenland site was flat and level and stands at about 3mOD.

Barrier Bank comprises a flood defence embankment, that runs parallel to New River, which was about 550m to the south-west of the site. The River Welland was located about 1.6km to the south-west.

The geological map for the area, sheet 144 ‘Spalding' at 1:50,000 scale, and Geology of Britain online viewer, show the site to be covered by Tidal Flat Deposits. These comprise a thick superficial cover of clay, silt and sand tidal creek deposits of the Terrington Beds. Older salt marsh and tidal creek deposits of the Barroway Drove Beds are indicated to underlie the Terrington Beds the boundary of which is often marked by the Nordelph Peat. The underlying solid geology is indicated to comprise the Oxford Clay at depth.

It is known from previous work in the Cowbit area that the Tidal Flat Deposits comprise an upper 1m to 2m thick mixed sequence of very soft/soft organic clay/peat; and clay/silt/sand, which pass into very soft, grey, organic clay with interbedded peat layers. At a

depth in the order of 10m to 12m the Tidal Flat Deposits are underlain by very stiff Glacial Boulder Clay proved to at least 20m depth.

HISTORY OF THE SITE

Research into the site history was previously undertaken by Ground Engineering Limited, report reference C15840 dated December 2022, and a summary of the findings is presented below.

Summary of Historical Information

Cowbit railway station is understood to have been opened by the Great Northern and Great Eastern Joint Railway in September 1867. The site was located directly to the north-west of the railway station and included a goods shed, a smaller building, and railway sidings as shown in the 1887 and 1888 map editions.

Whilst the railway station was closed by British Railways in September 1961, resulting in the removal of the railway sidings, the main line remained in use by diesel rolling stock through to its closure in November 1982. The railway lines were subsequently removed by November 1985. The plot and goods shed have remained as a derelict site through to the time of this report in December 2022.

SUMMARY OF ENVIRONMENTAL DATA

The previous Desk Study contains information derived from Environmental Databases for a radius of up to 2,000m from the site, and the findings are summarised below:

Database Summary

There are fourteen historical records relating to the railway siding usage on the site and a further twelve railway references (dated between 1887 and 1951) within 250m. A further five uses relate to horticultural nursery usage and one to a corn windmill (dated 1887 to 1989) within 250m.

There is one unspecified tank record (1992) located within 250m of the site.

There are no landfill sites or waste sites within a 250m radius.

There is one recent industrial usage, which relates to a pumping station indicated to be on the site, but which is actually just off-site to the east adjacent Mill Drove South, and three within 250m relating to farming, Crowland Pallets and an electricity substation.

There are six records of a sewage discharge consent for Cowbit WRC located 97m to the north-west.

The site is indicated to be directly underlain by superficial Tidal Flat Deposits with the underlying solid geology identified as the Oxford Clay Formation, which are both Unproductive in terms of aquifer classification. There are no surface water or groundwater abstraction points within 250m distance from the site.

There are twenty-eight drains listed around the site including the New River, a primary water course, which is located 0.6km to the west of the site.

The site lies within an area that has a low and medium risk of flooding and lies within an area that also has negligible risk below surface for groundwater flooding.

The property is in an area where less than 1% of properties are above the action level for radon. The site lies within an area where no radon protection measures are necessary.

SITE WORK

The site work conducted between 15th December 2022 and 5th January 2023 comprised two cable percussion boreholes (BH1 and BH2) and five machine excavated trial pits (TP1 to TP3, TP5 and TP6). The positions are shown on the exploratory hole location plan following this report text.

Public utility service drawings were sourced and consulted prior to determining the exploratory hole positions. Prior to excavation, a service scan was made at each position using a CAT (Cable Avoidance Tool) to check for the absence of detectable buried services that may otherwise have been damaged by the investigation.

The exploratory hole records, presented following the plans, give the descriptions and depths of the various strata encountered, details of all samples taken, in-situ tests, installation details and the groundwater conditions observed during and on completion of excavation, boring and subsequent monitoring.

Cable Percussion Boreholes

The cable percussion boreholes (BH1 and BH2) were undertaken using a standard cable percussion rig. Prior to boring, a starter pit was dug at each borehole position to 1.20m below ground level using hand tools, in order to ensure the absence of buried services. The boreholes were then advanced from the base of the starter pits using weighted claycutter and shell tools, initially working within 150mm diameter casing.

Representative small disturbed (D) and bulk (B) samples were taken at regular intervals throughout the boreholes. Near surface samples of soil were also sealed in amber glass jars, pending selection for chemical laboratory testing. Water samples (W) were obtained when sufficient groundwater had entered the holes for collection and were sealed in 1 litre plastic bottles.

Standard penetration tests were undertaken in order to give an indication of the in-situ relative density/shear strength of coarse-grained soil. The test was made by driving a 50mm

diameter split spoon sampler (S) into the soil at the base of each borehole by means of an automatic trip hammer weighing 63.50kg falling freely through 760mm. The penetration resistance was determined as the number of blows (N) required to drive the tool the final 300mm of a total penetration of 450mm into the soil ahead of the borehole. When the full penetration was not achieved, the depth driven and the number of blows was recorded, and the SPT was extrapolated. The SPT results are tabulated to the rear of the borehole records, plotted against depth in Figure 1, and presented on the soil profile in Figure 3.

Undisturbed samples, 100mm in diameter, were taken in clay at regular intervals. The ends of the samples were capped to maintain them in as representative condition as possible during transit to the laboratory.

On completion of the boreholes, a 50mm diameter gas and groundwater monitoring standpipe was installed to 7.00m depth at each location. The annulus around the standpipe was backfilled with pea gravel with a bentonite seal placed around the top of the installation within 1.00m of ground level. A gas tap was installed in the top of the standpipe and a protective stopcock cover was concreted into the ground flush with the surface at each position.

Machine Excavated Trial Pits

Trial pits TP1 to TP3, TP5 and TP6 were excavated using a JCB 3CX to depths of between 1.00m and 3.10m. The exposed strata were sampled and recorded by a Geoenvironmental Engineer. Representative small (D) and bulk (B) disturbed samples of soil were taken at regular intervals throughout the depth of each trial pit. It was not possible to undertake the proposed trial pit TP4 as the area was extensively overgrown with brambles.

An indication of the shear strength of clay soils was made using a hand shear vane (V) and the readings are presented on the trial pit records. The apparent cohesion results have been plotted against depth in Figure 2.

Soakaway testing was carried out within trial pit TP2 in broad accordance with BRE Digest 365 (2016) in order to allow the assessment of the soil infiltration rate. The general method of the test was to excavate the trial pit with vertical sides trimmed square to the base.

The dimensions were accurately measured and recorded, and the pit was then filled with clean water from a large container. The rate of water dissipation from the pit was measured by recording the depth of water relative to a datum at frequent time intervals. The test was monitored for 267 minutes and in that time had only half emptied, so additional refills were not undertaken within the day. The results are presented and follow the trial pit record.

On completion, the trial pits were emptied of any remaining water and backfilled with arisings.

Gas and Groundwater Monitoring Visits

As part of this investigation three return visits were made to site on 5th, 12th and 20th January 2023, when the standpipes installed within the boreholes were monitored for standing groundwater level and for landfill type gases. The results of the monitoring visits are presented following the exploratory hole records.

LABORATORY WORK

The samples were inspected in the laboratory and assessments of the soil characteristics have been taken into account during preparation of the exploratory hole records. The soil descriptions have been made in accordance with BS5930:2015+A1:2020. The geotechnical test results, undertaken in accordance with BS1377:1990, 2016 & 2022, are presented following the exploratory hole records. The chemical test results follow the geotechnical test results.

The moisture content and index properties of selected soil samples were determined as a guide to soil classification and behaviour. The liquid limit was determined by a cone penetrometer.

The particle size distributions of selected samples were obtained by sieve analysis. The particle size distribution passing the 63μm sieve was obtained by pipette sedimentation on one of the selected samples. Results of these tests have been combined and are presented as particle size distribution curves at the end of this report.

Test specimens were prepared at full diameter from selected undisturbed samples. Immediate undrained triaxial compression tests were performed under single confining cell pressures. The moisture content and bulk density of each specimen were also determined. The triaxial results are plotted against depth in Figure 2 with the hand vane results.

An indication of the swelling and settlement characteristics of selected samples of clay was obtained from the consolidation apparatus or oedometer. Each test was performed on a specimen approximately 19mm thick, contained in a steel ring. The sample was saturated and the swelling pressure balanced prior to applying a constant load with drainage allowed at both ends. When primary compression was complete, the load was increased and this repeated for three increments of load. The sample was then unloaded. The rate and total amount of consolidation were continually monitored using a computer controlled E.L.E. Datasystem 7 Unit. The results were plotted and analysed by the computer for each increment of load to obtain the

coefficients of compressibility (m_v), and of consolidation (c_v), which govern the amount and rate of settlement respectively.

California Bearing Ratio (CBR) tests were performed on selected recompacted near surface samples to Lincolnshire County Specification. The test consisted of jacking into the soil a cylindrical plunger with a cross sectional area of 1935mm^2. A nominal force of 11N was applied initially to seat the plunger on the soil surface and then the plunger was made to penetrate the soil at a uniform rate of 1mm/min. Readings of force were taken at intervals of penetration of 0.25mm to a penetration not exceeding 7.50mm. The CBR value is the ratio of the force required to achieve 2.50mm or 5.00mm penetration to standard forces expressed as a percentage.

Selected samples of soil and groundwater were analysed to determine the concentration of soluble sulphates. The pH values were also determined.

Chemical analysis of soil samples recovered from the exploratory holes was undertaken, by an independent laboratory, primarily for characterisation purposes. The samples were tested for a suite encompassing a wide range of potential contaminants outlined by the Environment Agency (EA) and National House Building Council (NHBC) document R&D 66; 2008 'Guidance for the Safe Development of Housing on Land Affected by Contamination'. In addition, all of the selected samples were screened for the presence of asbestos, and were also tested for total petroleum hydrocarbons (TPH).

One sample was also tested for the UK Water Industry Research (UKWIR) 'full suite', for guidance on the selection of water supply pipes to be used on brownfield sites.

GROUND CONDITIONS

The ground conditions have been plotted as a soil profile in Figure 3. The ground conditions comprised a surface layer of made ground to between 0.10m and 1.00m depth, underlain by a thick layer of superficial Tidal Flat Deposit, Marine Sand, Old Beach Deposit, glacial Till and in turn the solid geology Oxford Clay below 17.50m depth, which was encountered to at least the base of the boreholes at 20.00m depth. Groundwater was recorded as shallow as 1.65m below ground level during the monitoring phase of the investigation.

Made Ground

A surface layer of hardstanding was locally present in the southern part of the site, which was not penetrated by this investigation. Made ground was encountered to between 0.10m and 1.00m depth. The made ground comprised soft or firm, dark grey, brown and dark brown, slightly sandy, slightly gravelly, silty clay fill with occasional cobbles of brick, varying to very clayey sand and gravel fill with occasional organic matter. The gravel fraction comprised angular to rounded flint, quartzite, limestone, asphalt, clinker, ash, plastic, concrete and brick fragments. Locally in TP1, TP2, TP3 and TP6, a 0.21m to 0.45m thick layer of light brown, locally silty, sand and gravel fill with a gravel fraction of angular to rounded quartzite, quartz and flint with occasional ash and brick fragments was encountered.

Tidal Flat Deposit

Beneath the surface made ground in all positions except BH1, at between 0.10m and 0.70m depth, soft or firm, and locally stiff in TP1, dark grey, brown and orange brown, locally slightly gravelly (BH2), slightly sandy, silty clay was encountered to depths of between 0.90m (TP6) and 1.50m depth (TP5), which was considered to represent a superficial Tidal Flat Deposit. The gravel fraction in BH2 comprised sub-angular flint, quartzite and sandstone. Trial pit TP2 was completed within slightly sandy, silty clay.

At 0.90m to 1.30m depth in TP6, and 1.20m to 1.65m depth in TP1, brown and light brown, locally clayey, silty fine grained sand was encountered, which was considered to represent 'roddons' within the Tidal Flat Deposit.

Directly beneath the made ground at 1.00m depth in BH1, and beneath the sandy clay and sand layers at between 1.30m and 1.65m depth, soft or very soft, locally firm (TP3), brown and grey, silty, organic clay with bands of amorphous to pseudofibrous peat was encountered to at least the base of trial pits TP1, TP3, TP5 and TP6, to 5.00m depth in BH1, and 6.00m depth in BH2.

Marine Sand/Old Beach Deposit

Beneath the Tidal Flat Deposits in BH1 at 5.00m depth, and 6.00m depth in BH2, very loose to loose, very silty, fine grained sand was encountered to 9.50m depth in both boreholes. These soils were considered to represent Marine Sand.

At 9.50m depth in the boreholes, initially loose or very loose, becoming medium dense to very dense, silty, gravelly sand was encountered to 11.60m depth in BH2, and 11.80m depth in BH1. The gravel fraction comprised angular to sub-rounded flint, limestone, quartzite and shell fragments. These soils were considered to represent an Old Beach Deposit.

At 11.60m to 11.90m depth in BH2, a layer of soft, brown and grey, silty clay was encountered, which was underlain to 12.30m depth by a slightly silty, sand and gravel, also to considered to represent an Old Beach Deposit.

Till

Beneath the Old Beach Deposit in the cable percussion boreholes at 11.80m and 12.30m depth, stiff or very stiff, locally fissured, brown and grey, slightly gravelly, silty clay was encountered to 17.50m depth. The gravel fraction comprised angular to rounded flint and chalk. These soils were considered to represent a glacial Till.

Oxford Clay

At 17.50m depth in both boreholes, very stiff, fissured, grey, silty Oxford Clay was encountered to 20.00m depth, where they were completed.

Groundwater

Groundwater seepages were noted at between 1.05m and 4.40m depth within the Tidal Flat Deposits. A suspected water strike was encountered at 5.00m depth in BH1, on entering the Marine Sand. Groundwater was also struck at 9.50m depth in BH2, on entering the Old Beach Deposit, rising to 4.70m depth, and at 11.90m in BH2 rising to 2.80m depth. The shallow trial pit TP2 was dry during excavation and on completion of the hole at 1.00m.

During monitoring of the standpipes in January 2023, groundwater was recorded at between 1.65m (BH2) and 1.85m depth (BH1).

Observations

Live roots were observed in most of the exploratory holes, and to a maximum 1.40m depth in TP6.

Excavation Stability

The trial pit sides were stable during excavation and on completion.

Evidence of Contamination

The made ground encountered during this investigation was not noted to have olfactory or visual evidence of fuel contamination. The made ground contained occasional asphalt, clinker, ash, plastic, concrete and brick fragments. No asbestos containing materials were noted in the soils during this investigation, or during testing.

COMMENTS ON THE GROUND CONDITIONS IN RELATION TO FOUNDATION DESIGN AND CONSTRUCTION

This investigation found made ground to a maximum 1.00m depth in the southern of the site, covering superficial Tidal Flat Deposits to a maximum depth of 6.00m, superficial Marine Sand and Old Beach Deposit to a maximum 12.30m depth, in turn covering glacial Till and the solid geology Oxford Clay below 17.50m depth. Groundwater was met as shallow as 1.65m depth during the monitoring period of the investigation in January 2023.

The proposed development was understood to comprise construction of a new residential development, with associated access drives, parking and gardens. The proposed development plan is presented to the rear of the report text. Excavations would locally be expected to encounter groundwater below 1.00m to 1.50m depth based on the findings of this investigation. The proposed development loads were not known at the time of report writing but the dwellings were assumed to be lightly loaded.

The made ground, root affected clay and locally soft and organic clay soils should all be avoided as bearing strata. The firm and stiff, superficial Tidal Flat Deposits could offer support for lightly loaded traditional foundations for the proposed dwellings, however they are locally absent and have variable properties across the site, with their bearing capacity limited by the underlying soft and very soft organic clay soils. For anything other than lightly loaded structures, or within areas of deep root influence, a piled foundation scheme will be necessary in order to transfer loads into the underlying Old Beach Deposit, glacial Till or Oxford Clay at depth.

Localised deepening of traditional foundations will be required where the proposed dwellings are located close to the existing trees in clay soils. Foundations will need to penetrate the made ground and zones of root influence within clay soils.

Where made ground is thick, in locally root affected clay, and where piled foundations are adopted, floor slabs will need to be suspended.

Traditional Shallow Foundations

Large scale processes of natural sedimentation allow a certain degree of confidence to be placed in the absence of important variation of the engineering properties of natural soils across sites. The made ground had variable bearing properties and was locally found to a maximum depth of 1.00m. The made ground, root affected clay and soft organic clay soils should all be avoided as bearing strata.

Samples of clay had modified plasticity indices of between 11% and 73%, which rate the soil as having a low to high volume change potential based on NHBC Standards Chapter 4.2 'Building near trees' (2023). On an open site, at least 30m distant from mature trees, a minimum foundation depth of 1.00m (where the naturally deposited clay is present at such a depth) below current or proposed ground level, whichever is greater, would be required in order to be below the zone of seasonal volume change in accordance with the above standards. The presence of existing trees including Lombardy Poplar, Silver Birch and Leyland Cypress, will locally have increased the depth affected by seasonal changes in moisture content of clay soils. Reference to the NHBC Standards above, indicates for example a minimum footing depth of 1.00m could be adopted where footings are at least 7m from low water demand mature Silver Birch trees, at least 12m from a high water demand Leyland Cypress tree, and at least 32m from a high water demand Lombardy Poplar tree.

In summary, foundations for the new dwellings will need to be a minimum of 1.00m deep in naturally deposited clay soil, but must be deepened in order to penetrate any made ground and root affected clay.

Bearing Capacity

The firm Tidal Flat Deposit, or clayey/silty, fine grained sand if present, at 1.00m depth, offers a maximum safe bearing capacity of only 30kN/m^2 beneath a 0.60m wide strip footing, with a factor of safety of 3.0 applied against shear failure, which may not be sufficient to support the loads of the dwellings. The maximum safe bearing capacity in the Tidal Flat Deposits has been limited to avoid overstressing any soft organic clay. Care should be taken to

avoid bearing upon, or straddling, the soft organic clay locally encountered as shallow as 1.00m depth in BH1, otherwise differential settlement will occur. Deeper foundations would have a lower bearing pressure of 15kN/m^2 at 2.00m depth beneath a 0.60m wide footing.

Excavations

The underlying soils should be easily removed within excavations for the proposed buildings, although the surface hardstanding and existing foundations of the former railway building will be more difficult to remove and require the use of a breaker. The sides of excavations within any made ground are likely to be unstable and should not be relied upon to stand unsupported.

Excavations would locally be expected to encounter groundwater within the Tidal Flat Deposit soils based on this investigation. Where excavations encounter perched groundwater within the made ground or superficial Tidal Flat Deposit there is likely to be resulting side instability. Care should be taken not to excavate below the water table in the absence of suitable groundwater control and side support, such as dewatering via screened sumps and trench side support. Care should be taken to keep the excavations dry.

Attention should be given where personnel are to enter deep excavations, when sides should either be safely battered back, or close side support provided, in order to comply with statutory safety requirements and prevent sidewall collapse.

Piled Foundations

The glacial Till and Oxford Clay are suitable strata into which piles can be installed. The ground conditions favour the adoption of CFA or bored piles. Driven piles may be ruled out due to the potentially damaging vibrations to shallow founded properties nearby and the noise that may be generated in this residential area. The advice of a specialist piling contractor should be sought prior to design, piling through obstructions such as cobbles of concrete and brick within the made ground; and casing through water-bearing granular layers.

Piles should be sleeved through root affected clay and to a suitable depth.

For the purposes of preliminary pile design, the pile bearing coefficients given below, which are based on the following assumptions, may be used to assess working loads for a bored pile.

1) Ultimate shaft friction/adhesion within the made ground is ignored. Values of negative shaft adhesion should be considered if the ground is to be surcharged close to piles, for example by ground bearing floor slabs.

2) The ultimate load on a pile would be the sum of the side friction/adhesion acting on the pile shaft together with the end bearing load.

3) In coarse-grained strata, the shaft friction would be a function of the in-situ standard penetration test results (plotted in Figure 1) and effective overburden pressure. The groundwater level is assumed at approximately 1.00m to 1.50m below ground level, based on the conditions at the time of the investigation in January 2023.

4) In clay strata the shaft adhesion and end bearing would be a function of the apparent shear strength values obtained from the triaxial compression tests as plotted in Figure 2 and SPT N values plotted in Figure 1.

5) A factor of safety (F) of at least 2.5 would be used to assess pile working loads, unless test loading is undertaken. Where piles are to be largely end-bearing an increased factor of safety of 3.0 would be appropriate.

Item	**Ultimate Pile Bearing Value kN/m^2**
Shaft friction/adhesion in made ground and root affected clays	Nil
Average shaft adhesion in Tidal Flat Deposits	5
Average shaft friction in Marine Sand	5
Average shaft friction in Old Beach Deposit	20
Average shaft adhesion in Till	70
Average shaft adhesion in Oxford Clay	100
End bearing Till 12.50m to 17.50m depth	1250
End bearing in Oxford Clay below 17.50m depth	1800

Using these coefficients and thicknesses of strata met in BH1, a single 450mm diameter bored pile, installed to depths of 13.00m and 15.00m, would support estimated working loads in the order of 175kN (F=2.5) and 255kN (F=2.5), respectively.

Different pile lengths, or diameters, from those detailed would give different available working loads, which could be tailored to suit the working loads required.

Piles would need to be spaced at least 3.0 pile diameters apart (centre to centre) if capped pile groups are used, otherwise a reduction in available working load would result. Reduction of the pile working loads will be necessary if the ground is to be surcharged close to the piles, for example by a ground bearing floor slab. A piling specialist should undertake final design of piles.

Floor Slabs

Ground bearing floor slabs should not be adopted for the new dwellings due to the thickness and variability of the underlying made ground present, and locally root affected clay soils.

If such clay is left, damaging differential heave movements could occur across such a slab, particularly where it covers any clay affected by recently severed tree roots. A suspended floor slab could be adopted with piled foundations and will avoid large total and differential consolidation settlements, together with any volume change movements within root affected clays, providing that the sub-floor gaps recommended in Table 7 of the NHBC Standards Chapter 4.2 (2023), are adopted.

Hardstanding

Made ground soils comprising soft, slightly sandy, slightly gravelly, silty clay fill, or firm, slightly sandy to slightly gravelly, silty clay Tidal Flat Deposit were generally encountered at sub-grade level across this site.

Laboratory determined CBR values of between 0.3% and 1.0% were determined on naturally deposited near surface Tidal Flat Deposits. Based on IAN 73/06, Table 5.1

recommends a design CBR value of 3.0% for silty or sandy clay with a plasticity index of 10% or 30%, and a design CBR value of 1.0% for silt.

A design CBR value of 1.0% for the naturally deposited silty or sandy clay soils, or 1.0% for silt, should be adopted for hardstanding design on this site.

The sub-grade should be suitably compacted and inspected, with any unsuitable made ground, topsoil, very soft, organic or desiccated clays, being removed and replaced with suitable well-graded coarse-grained fill. Care should be taken not to allow exposed clay soils at sub-grade level to become exposed to inclement weather conditions or the shallow groundwater, since they are prone to rapid softening and deterioration. A permeable geotextile should be incorporated in order to prevent both loss of any sub-base material into the sub-grade and migration of sub-grade soils into the overlying sub-base.

Drainage

The soakaway test in TP2 determined an extrapolated soil infiltration rate (f) of 4.18×10^{-6}m/s, for the Tidal Flat Deposit clay. This result rates the soil as having a 'poor' drainage potential according to BS8004:1986 Figure 6.

Excavations would locally be expected to encounter groundwater below 1.00m to 1.50m depth based on the findings of this investigation. Any soakaway drainage is likely to deteriorate over time as the chambers become blocked with silt. Provision should be made for regular cleaning. There would be no advantage in excavating soakaway chambers below the groundwater level, which reduces the effective volume of the soakaway.

Sulphate Conditions

Sulphate analysis of selected samples of soil and groundwater yielded soluble sulphate concentrations within Design Sulphate Classes DS-1, DS-2 and DS-3, of the BRE Special Digest 1, Table C1 (2005), presented in Appendix 1. The pH results of the samples ranged between 7.2 and 8.5 indicating alkaline conditions.

These results indicate an Aggressive Chemical Environment for Concrete (ACEC) Class of AC-3 for buried concrete. This ACEC Class should be considered when specifying a Design Chemical Class (DC Class) for buried concrete on this site, as detailed in the above cited BRE document.

SOIL GAS MONITORING

The monitoring of soil gasses (methane, carbon dioxide and oxygen) within the standpipes installed within boreholes BH1 and BH2 was undertaken on 5th, 12th and 20th January 2023. The results of the monitoring are summarised in Table 1 below.

Table 1: Summary of Gas Monitoring Data

Hole Location	No. Visits	Methane (% v/v)	Carbon Dioxide (% v/v)	Oxygen (% v/v)	Flow (l/hr)	Water Level (mbgl)	Atmospheric Pressure (mb)
BH1	3	<0.1	0.6-1.8	18.5-20.0	<0.1	1.78-1.85	1001-1017
BH2	3	<0.1	3.2-4.9	15.0-18.0	<0.1	1.65-1.73	1001-1018

The results of the soil gas monitoring of the installations indicated less than 0.1% by volume methane and a maximum 4.9% by volume carbon dioxide, recorded during the monitoring visits. The in-situ measurements recorded gas emission rates of less than 0.1l/hr.

Using a flow rate of 0.1l/hr, these in-situ measurements indicate a Gas Screening Value (GSV) of 0.0001l/hr for methane and 0.0049l/hr for carbon dioxide. These results typically fall into Characteristic Situation 1 as defined by BS8485:2015 'Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'. These results indicate a very low hazard potential, and that no special gas protection measures are necessary.

COMMENTS ON THE SOIL CHEMICAL TEST RESULTS

The results of the laboratory chemical testing on near surface soil samples have primarily been compared to soil screening values (SSVs) produced by Land Quality Management Limited (LQM) and the Chartered Institute for Environmental Health (CIEH) presented in their document 'The LQM/CIEH S4ULs for Human Health Risk Assessment: 2015 (Publication Number S4UL3608)'. The LQM/CIEH S4ULs are intended for use in assessing the potential risks posed to human health by contaminants in soil and are transparently-derived and cautious 'trigger values' above which further assessment of the risks or remedial action may be needed. The S4ULs (Suitable for Use Levels) have been derived, in accordance with UK legislation and Environment Agency policy, using a modified version of the Environment Agency CLEA 1.06 software.

Reference has also been given to ATRISKsoil soil screening values produced by Atkins Limited and provided under licence to Ground Engineering Limited. Atkins SSVs have been derived in line with the Environment Agency 2009 guidance using the CLEA 1.071 software. With the absence of a S4UL for cyanide the ATRISKsoil SSV has been used as the soil screening criteria within this report.

In 2014 the Department for Environment Food and Rural Affairs (DEFRA) published, in their document SP1010, Category 4 Screening Levels (C4SL) for several contaminants including lead. The C4SL represent screening levels below which the land could be considered suitable for a specified use and definitely not contaminated land in respect of those determinands. With the absence of S4UL for lead the C4SL has been used as the soil screening criteria within this report.

For each contaminant the adopted soil screening criteria have been calculated for the following land uses:

- Residential use with home grown produce
- Residential use without home grown produce
- Commercial and industrial usage

The intended purpose of the SSVs are as “intervention values” in the regulatory framework for assessment of human health risks in relation to land use. These values are not binding standards, but are intended to inform judgements about the need for action to ensure that a new use of land does not pose any unacceptable risks to the health of the intended users.

Table 2 compares the test results for the made ground with the SSVs in relation to the specified uses. The number of test results, which exceed these values, are also provided. Statistical analysis has also been undertaken on this data-set.

Table 2: Comparison of Chemical Test Results with SSVs for Near Surface Soils

Determinand	Number of Samples	Min Value mg/kg	Max Value mg/kg	Number of Samples Exceeding SSV for			Measured 95th Percentile mg/kg	Assessment Method	Soil Screening Criteria 1.0% SOM		
				Residential with home grown produce	Residential without home grown produce	Commercial/ Industrial			Residential with home grown produce mg/kg	Residential without home grown produce mg/kg	Commercial/ Industrial mg/kg
Organic Matter	8	0.52%	20%	-	-	-	-	-	-	-	-
Arsenic	8	8.0	32	0	0	0	22.68	S4UL	37	40	640
Cadmium	8	<0.10	0.21	0	0	0	0.18	S4UL	11	85	190
Chromium	8	11	32	0	0	0	23.06	S4UL	910	910	8600
Chromium (VI)	8	<0.50	<0.50	0	0	0	<0.50	S4UL	6	6	33
Lead	8	14	62	0	0	0	60.68	C4SL	200	310	2330
Mercury	8	<0.05	0.16	0	0	0	0.12	S4UL	11	15	320
Selenium	8	0.35	2.2	0	0	0	1.27	S4UL	250	430	12,000
Nickel	8	11	32	0	0	0	22.54	S4UL	130	180	980
Phenols	8	<0.10	0.12	0	0	0	0.11	S4UL	120	440	440
Benzo[a]pyrene	8	<0.10	33	6	4	2	16.91	S4UL	0.79	1.2	15
Copper	8	16	85	0	0	0	44.90	S4UL	2400	7100	68,000
Zinc	8	37	88	0	0	0	81.34	S4UL	3700	40,000	730,000
Free Cyanide	8	<0.50	<0.50	0	0	0	<0.50	ATRISK	34	34	34

Notes
S4UL and C4SL for metals were derived using 6% SOM. These values are not sensitive to SOM and would also be applicable for 1% SOM and 2.5% SOM.
LQM/CIEH S4ULs 'Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3608. All rights reserved'.
ATRISKsoil SSVs produced by Atkins Limited and provided under licence to Ground Engineering Limited.

Discussion of Soil Results

Elevated benzo[a]pyrene concentrations were recorded in the southern part of the site (TP1 to TP3 and BH1), which exceeded the residential with home grown produce end use and residential without home grown produce end use screening values. The highest concentrations of benzo[a]pyrene also exceeded the associated screening value for a commercial/industrial end use.

Levels of all other elements and compounds in the samples tested were within the associated soil screening values for both residential end uses and for commercial/industrial end use.

The US95 value for benzo[a]pyrene exceeded the screening value for a residential with home grown produce end use, and exceeded the screening values for a residential without home grown produce. The benzo[a]pyrene US95 value also exceeded the screening value for a commercial or industrial usage. None of the US95 values for the other elements and compounds tested, exceeded the corresponding screening values for either of the residential end uses or for a commercial or industrial usage.

The made ground encountered during this investigation was not noted to have olfactory or visual evidence of fuel contamination. The total petroleum hydrocarbon (TPH) concentrations of less than 10mg/kg (below laboratory detection limit) and 1500mg/kg obtained from samples of made ground are not considered significant. This highest concentration is considered to be related to the ash and asphalt content in this sample, as the double ratio plot indicates a combustion/coal derived source.

No asbestos containing materials (ACM) were observed within the made ground soils during site work or testing in the laboratory.

The UKWIR test results from a sample of clay fill from BH2 at 0.30m to 0.50m depth were generally below laboratory detection limit, with the other results below soil screening values. These results should be presented to the water company for their assessment.

In conclusion, the near surface fill soils, except the silty sand and gravel, would not be considered suitable with regard to the proposed gardens and landscaped areas of the

proposed development, and would also not be considered suitable for use beneath proposed hardstanding and dwellings.

UPDATED CONCEPTUAL MODEL

Assessment of the potential linkage between ground contamination sources, human and environmental receptors have been assessed based on the previous desk study research and the intrusive ground investigation documented in the preceding sections of this report.

A generalised conceptual model relative to the existing site and proposed residential use of the site is presented in Table 3 below.

Table 3: General Conceptual Model Relative to Future Residential Development

Receptors	Pathway	Estimated Potential for Linkage with Contaminant Sources			
		Drainage/ Buildings	Soil	Soil Gas	Off-Site Sources
Human Health – ground workers	Ingestion and Inhalation of contaminated Soil, Dust and Vapour	Low/Low	Low	Moderate	Very Low
Human Health – users of completed development	Ingestion and Inhalation of contaminated Soil, Dust and Vapour	N/A	Low	Very Low	Very Low
Water Environment	Migration through ground into surface water or groundwater	Low	Very Low	Very Low	Low
Flora	Vegetation on site growing on contaminated soil	Very Low	Very Low	Very Low	Very Low
Building Materials	Contact with contaminated soil	Very Low	Very Low	Very Low	Very Low

Key to Table 3 Risk	Definition
Very High	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, or, there is evidence that severe harm to a designated receptor is currently happening. The risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) and remedial works may be necessary in the short term and likely over the long term.
Moderate	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild.
Low	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very Low	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.
N/A	Not Applicable because the proposed development will remove the source.

COMMENTS ON GROUND CONTAMINATION IN RELATION TO PROPOSED DEVELOPMENT

Anticipated exposure scenarios relating to the existing site, the site history and proposed residential end use of the site, in the context of the conceptual model, are discussed as follows.

This investigation may not have revealed the full extent of contamination on the site and appropriate professional advice should be sought if subsequent site work reveals materials that may appear to be contaminated.

Contaminated Soil

On the basis of the ground investigation, the site is underlain by up to 1.00m of made ground. The chemical testing has identified elevated concentrations of benzo[a]pyrene in the soils tested with respect to the proposed soft landscaping around the residential development, and would also not be considered suitable beneath buildings or areas of permanent hardstanding. The contaminants in the made ground indicates that there is a low risk of contaminants affecting groundworkers during any construction works, and there will be a low risk of affecting future end users of the site.

The brown silty sand and gravel made ground, locally encountered in TP1, TP2, TP3 and TP6 could be considered for re-use beneath proposed buildings and permanent hardstanding, if suitable for engineering purposes, where it is unlikely to affect future users of the site, however these soils could affect buried services.

The underlying naturally deposited soils encountered beneath the site would be considered suitable for retention and re-use within the development if required.

Existing Drainage

Redundant drain runs, where encountered, should be removed from beneath the site and precautions should ensure that any remaining effluent is directly disposed off-site. The

integrity of existing drainage should be checked, and if they are to be retained any damaged sections should be replaced prior to development. The latter measures should minimise any future risk to human health and the water environment.

Existing Building

An asbestos survey of the existing building should be undertaken prior to demolition for the proposed redevelopment. No evidence of asbestos was noted in the soils during this investigation. Suitable precautions, in line with current best practice, should be put in place to protect workers from the effects of asbestos material, during the site clearance and redevelopment phases.

There is a very low risk of contamination affecting the proposed structures and their foundations.

Soil Gas

According to the environmental database there are no landfills recorded within 250m of the site. The site is underlain by a thin layer of made ground, covering a superficial Tidal Flat Deposit comprising silty, organic clay, and in turn superficial Marine Sand below 5.00m to 6.00m depth. Less than 0.1% by volume methane and a maximum 4.9% by volume carbon dioxide was recorded in the standpipes during the monitoring period.

There is a moderate risk that hazardous gases would affect groundworkers during the construction phase and a very low risk of hazardous gases affecting future users of the site.

Consideration should be given to gas monitoring within deep or confined spaces, particularly where thick made ground and organic soils are present, to ensure safety of personnel entering them, since carbon dioxide could accumulate within any excavations, service chambers or sub-structures.

The site is not in a radon affected area, and no radon protection measures are required for new properties on the site.

Human Health - Construction Workers

Based on the chemical test results, no special precautions would be required during the development of the site by workers who may come into contact with the soil during groundworks, providing standard precautions are adopted which should generally include the procedures given by the Health and Safety Executive (The Blue Book) HS(G)66.

For the protection of workers during groundworks the following is recommended:

a) Limit repeated or prolonged skin contact with soils by wearing gloves with sleeves rolled down.

b) Washing facilities should be made available to groundworkers, so as to minimise the potential for inadvertent ingestion of soil.

c) If any soils are revealed which are different to those encountered by this ground investigation, the advice of a specialist should be sought in view of classifying the material and ascertaining its risk to groundworkers.

d) Suitable precautions, in line with current best practice, should be put in place to protect workers from the effects of asbestos containing material, during the site clearance phase.

e) Consideration should be given to gas monitoring within deep or confined spaces, particularly where thick made ground soils are present, to ensure safety of personnel entering them, since carbon dioxide could accumulate within any excavations, service chambers or sub-structures.

Human Health - Users of Completed Development

The results of the chemical analysis indicate that the made ground should be considered unsuitable for retention or re-use at the surface within any new garden or landscaped areas. Within new front garden areas, the made ground should either be completely removed, or removed and replaced with a surface covering of at least 0.60m of certified 'clean' topsoil, which would be considered to provide a suitable pathway break. This should be increased to at least 1.00m in private rear garden areas. Where the made ground is less than 0.60m or 1.00m thick,

only the made ground would need to be removed. This would reduce the risk to future users of the development to very low.

The made ground, with the exception of brown, silty sand and gravel, would also be considered unsuitable for retention or re-use beneath proposed buildings and permanent hardstanding, and should be replaced with suitable fill which should not affect future users of the site.

Any soil imported to site must be certified as "suitable for use".

Water Environment

The site is underlain by a thick layer of superficial clay Tidal Flat Deposit, covering Marine Sand; Old Beach Deposit; glacial Till; and the solid geology Oxford Clay below 17.50m depth. The EA indicates the Tidal Flat Deposit and the underlying Oxford Clay to be 'Unproductive' strata. The Marine Sand and Old Beach Deposit are likely to be 'Secondary' Aquifers. The nearest surface water features are drains around the site, with New River located 0.6km west of the site. The site does not lie within a source protection zone.

Groundwater was recorded within the Tidal Flat Deposit during the investigation.

The risk to the water environment from soil contaminants is considered very low as it is unlikely that the proposed development and contaminants within the made ground soils would impact the quality of the water environment.

Effects on Building Materials and Buried Services

The sulphate requirements for buried concrete have been discussed in the previous section of this report.

The chemical test results, including UKWIR results, together with exploratory hole records, should be provided to Anglian Water for their assessment for the water supply pipes.

The local water supply company should be consulted if new buried plastic water pipes are to be installed within the made ground soils on this site.

Off-Site Disposal of Soil Arisings

The results of chemical analysis are provided to the rear of this report and can be used within the information necessary for basic characterisation of the soil destined for landfill. The Environment Agency publication Hazardous Waste, Technical Guidance WM3 outlines the methodology for classifying wastes and should be referenced for guidance. The test results (total metals, hydrocarbons and cyanide) should be compared to the relevant thresholds to determine whether they fall into the primary categories of non-hazardous or hazardous waste and will help indicate the likely European Waste Catalogue (EWC) code which is determined by the waste type.

Excavated material and excess spoil should always be classified prior to removal from site as required by 'Duty of Care' (Environmental Protection Act, 1990) legislation. This means that material has to be given a proper description and waste classification prior to removal. Basic characterisation is the responsibility of the waste producer and compliance checking and on-site verification are generally the responsibility of the landfill operator. The landfill operator will need to liaise with the waste producer as the approach relies on the information from basic characterisation.

It is expected that arisings of natural soils from the excavations across this site would fall into the inert category under the European Waste Catalogue description 'Soil and Stones', EWC code 17 05 04 with restrictions excluding topsoil and peat.

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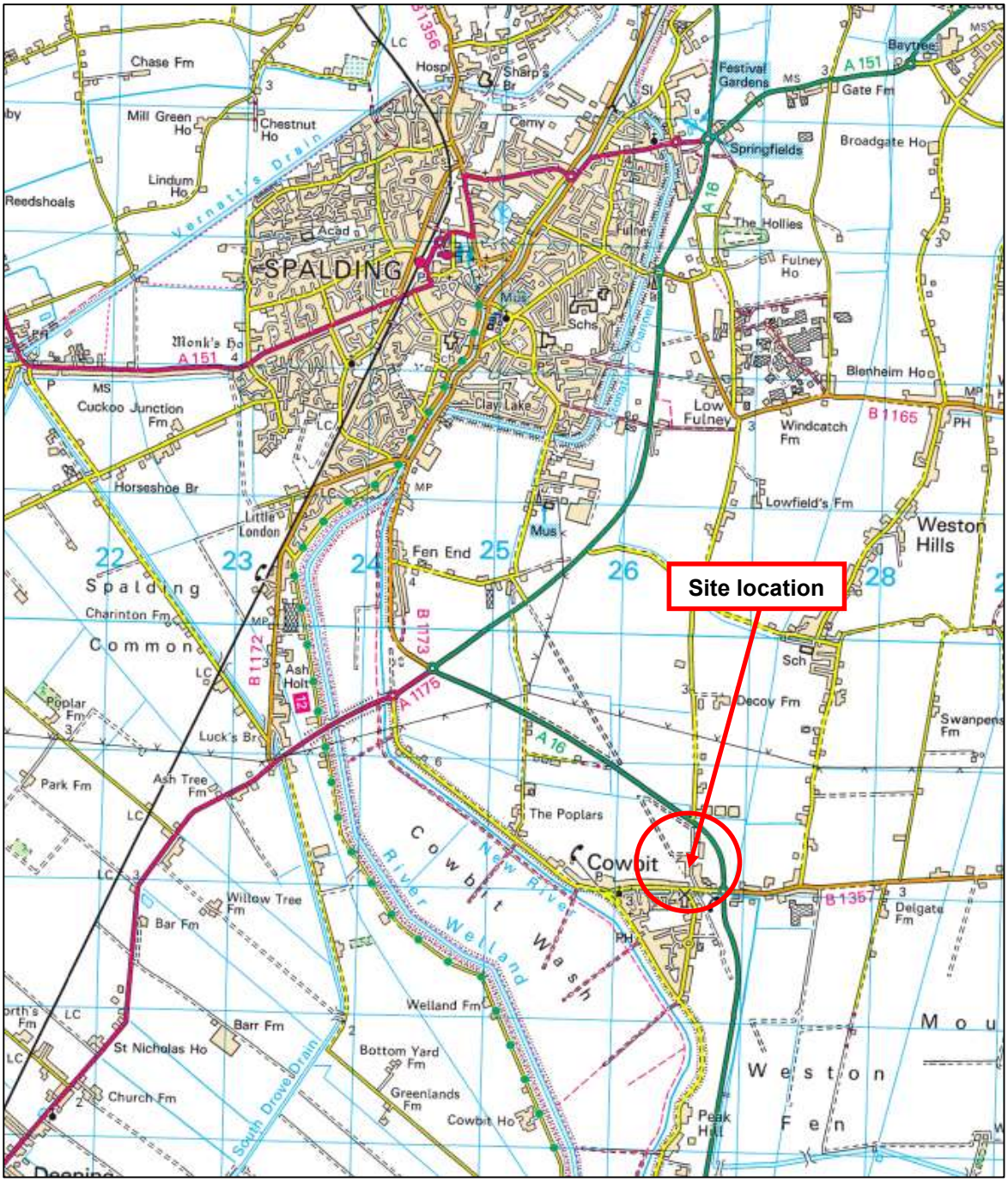
S. Weatherley

S. WEATHERLEY
B.Eng.(Hons.),
C.Geol., F.G.S.
Associate

C. M. J. EBELING
M.Sc.(Eng.), M.A.E.G.,
C.Geol., F.G.S.
Director

Site Location Plan

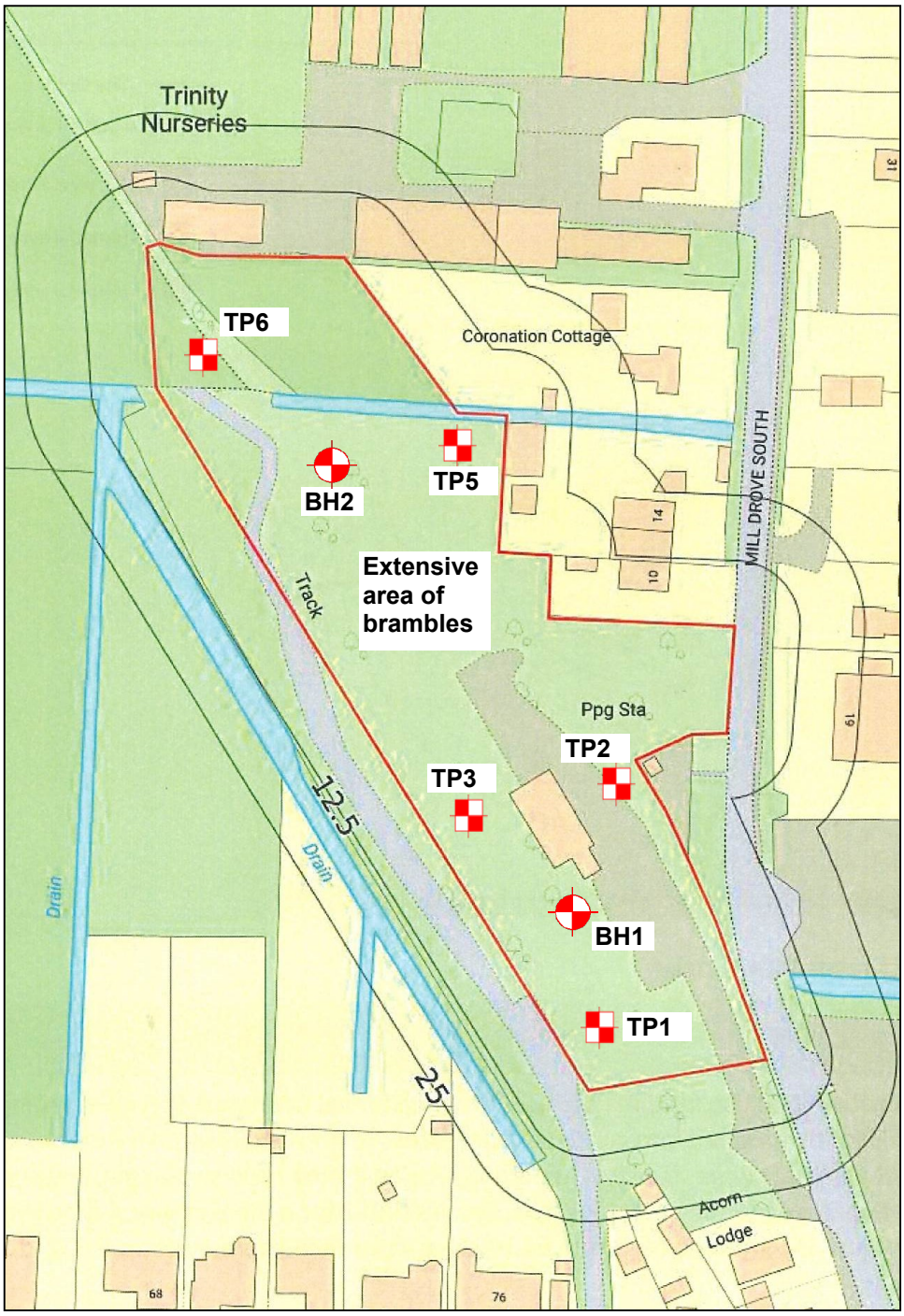
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Project : Station Yard, Mill Drove South, Cowbit, Lincolnshire **Client : Seagate Homes**	**GROUND ENGINEERING LIMITED** Peterborough Tel : 01733 566566	**Project No.** **C15840**

Exploratory Hole Location Plan

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Not to Scale

Project : Station Yard, Mill Drove South, Cowbit, Lincolnshire **Client : Seagate Homes**	**GROUND ENGINEERING LIMITED** Peterborough Tel : 01733 566566	**Project No.** **C15840**

Proposed Development Plan

Based on plan provided by client



Not to Scale

Project : Station Yard, Mill Drove South, Cowbit, Lincolnshire **Client : Seagate Homes**	**GROUND ENGINEERING LIMITED** Peterborough Tel : 01733 566566	**Project No.** **C15840**

GROUND ENGINEERING LIMITED

Tel: 01733-566566
www.groundengineering.co.uk

Site: STATION YARD, MILL DROVE SOUTH, COWBIT

BOREHOLE BH1

Date: 15/12/22 to 16/12/22

Hole Size: 150mm dia to 20.00m

Ground Level:

Samples and in-situ Tests			(Date) Casing	Inst.	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Blows						
0.00-0.30	B1				MADE GROUND - Dark brown, very clayey SAND AND GRAVEL. Gravel is angular to rounded flint, quartzite, concrete and brick fragments.		0.30	
0.30-1.00	B2				MADE GROUND - Soft, brown and dark brown, slightly sandy, slightly gravelly, silty CLAY. Gravel is angular to rounded flint, limestone, ash and brick fragments.		1.00	
1.20-1.65	U1	14			Soft, brown and grey, silty CLAY.			
1.50-2.00	B3							
1.78	W2							
2.00-2.30	U2	8	1.50		...Becoming very soft and organic below 2.00m depth.			
2.30-3.00	B4							
3.00-3.50	B5							
3.15-3.45	S	N1	3.00					
4.00-4.50	B6				(TIDAL FLAT DEPOSIT)			
4.15-4.45	S	N1	4.00	1				
4.45	D1							
4.60-5.00	B7							
5.00-5.50	B8			2			5.00	
5.15-5.45	S	N4	4.70		Loose, brown and grey, very silty SAND. Sand is fine grained.			
5.45	D2							
6.00-6.50	B9				...Becoming very loose below 6.00m depth.			
6.15-6.45	S	N2	6.00					
6.45	D3							
7.50-8.00	B10							
7.50	W1							
7.65-7.95	S	N0	7.50					
7.95	D4				(MARINE SAND)			
9.00-9.50	B11							
9.15-9.45	S	N1	9.00					
9.50-10.00	B12				Very loose, brown, silty, gravelly SAND. Gravel is fine and medium, angular to sub-rounded flint and shells. (OLD BEACH DEPOSIT)		9.50	
							10.00	

BENEATH INSTALLATION

REMARKS
1. Excavating a pit from 0.00m to 1.20m for 1.25 hours
2. Roots observed to 1.00m depth
3. Borehole cased to 12.30m depth
4. Gas monitoring standpipe installed to 8.00m depth

Project No 15840

Scale 1:50

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KEY
D - Disturbed Sample
B - Bulk Sample
U - Undisturbed Sample
W - Water Sample
S/C - SPT Spoon/Cone
▽ Water Strike
▼ Water Rise
N/* - SPT Blows for 0.3m or given penetration
ES - Environmental Sample
V - Vane Shear Test Cohesion ( ) kPa
▼c Level on completion
c▼w Level casing withdrawn
▼s Standpipe Level

Groundwater Strikes

No	Depth m Struck	Rose to	Rate	Cased	Sealed
1	4.40		seepage	4.00	not
2	5.00		strike	5.00	not
3	17.50		strike	12.00	not

Groundwater Observations

Date	Depth m Hole	Casing	Water
15/12/22	11.80	12.00	7.90
16/12/22	11.80	12.00	3.20
16/12/22	20.00	12.30	19.00
05/01/23	8.00	1.00	1.85
12/01/23	8.00	1.00	1.78

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Site: STATION YARD, MILL DROVE SOUTH, COWBIT

BOREHOLE BH1

Date: 15/12/22 to 16/12/22

Hole Size: 150mm dia to 20.00m

Ground Level:

Samples and in-situ Tests			(Date) Casing	Inst.	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Blows						
				BENEATH INSTALLATION	Very dense, brown, silty, gravelly SAND. Gravel is angular to sub-rounded flint, quartzite and shells.		10.00	
10.50-11.00	B13			BENEATH INSTALLATION				
10.65-10.88	S	52*	10.50	BENEATH INSTALLATION				
11.50	W2			BENEATH INSTALLATION	(OLD BEACH DEPOSIT)		11.80	
11.95-12.25	S	N24	11.80	BENEATH INSTALLATION	Stiff, brown, slightly gravelly, silty CLAY. Gravel is angular to rounded flint and chalk.			
11.90-12.50	B14							
12.35	D5			BENEATH INSTALLATION				
				BENEATH INSTALLATION				
				BENEATH INSTALLATION				
13.50-13.95	U3	50	12.30	BENEATH INSTALLATION				
13.95	D6			BENEATH INSTALLATION				
14.50	D7			BENEATH INSTALLATION	(TILL)			
15.00-15.30	U4	60	12.30	BENEATH INSTALLATION				
15.30	D8			BENEATH INSTALLATION				
				BENEATH INSTALLATION				
				BENEATH INSTALLATION				
16.50-16.90	U5	75	12.30	BENEATH INSTALLATION	...Becoming very stiff below 16.50m depth.			
16.90	D9			BENEATH INSTALLATION				
17.50	D10		3 ▽	BENEATH INSTALLATION			17.50	
				BENEATH INSTALLATION	Very stiff, fissured, grey, silty CLAY.			
18.00-18.40	U6	80	12.30	BENEATH INSTALLATION				
18.40	D11			BENEATH INSTALLATION				
19.00	D12		▼c	BENEATH INSTALLATION				
					(OXFORD CLAY)			
19.50-19.95	U7	80	12.30	BENEATH INSTALLATION				
20.00	D13			BENEATH INSTALLATION			20.00	

REMARKS: Borehole completed at 20.00m depth

Project No 15840

Scale 1:50 | Page 2/2

KEY
D - Disturbed Sample
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U - Undisturbed Sample
W - Water Sample
S/C - SPT Spoon/Cone
▽ Water Strike
▼ Water Rise
N/*- SPT Blows for 0.3m or given penetration
ES - Environmental Sample
V - Vane Shear Test Cohesion ( ) kPa
▼c Level on completion
c▼w Level casing withdrawn
▼s Standpipe Level

Groundwater Strikes						Groundwater Observations			
	Depth m						Depth m		
No	Struck	Rose to	Rate	Cased	Sealed	Date	Hole	Casing	Water
						19/01/23	8.00	1.00	1.81

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Site: STATION YARD, MILL DROVE SOUTH, COWBIT

BOREHOLE BH2

Date: 16/12/22 to 19/12/22

Hole Size: 150mm dia to 20.00m

Ground Level:

Samples and in-situ Tests			(Date) Casing	Inst.	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Blows						
0.00-0.30	B1				MADE GROUND - Grey and brown, very clayey SAND AND GRAVEL. Gravel is angular to rounded flint, quartzite, concrete, brick, asphalt and clinker.		0.30	
0.30-0.50	B2				MADE GROUND - Firm, brown and grey, slightly sandy, slightly gravelly, silty CLAY. Gravel is angular to sub-rounded flint, limestone, concrete, brick and plastic fragments.		0.50	
0.50-1.00	B3				Firm, brown and orange brown, slightly gravelly, sandy SILT/CLAY. Gravel is sub-angular flint, quartzite and sandstone. (TIDAL FLAT DEPOSIT)		1.30	
1.20-1.30	B4							
1.35-1.65	S	N2						
1.30-1.70	B5							
1.65	D1				Very soft, brown and grey, silty, organic CLAY with orange brown, fine grained sand partings and part decayed plant matter.			
1.65	W3							
2.00-2.45	U1	7	2.00					
2.45	D2							
3.00-3.45	U2	4	3.00					
3.45	D3							
4.00-4.45	U3	3	4.00					
4.45	D4				(TIDAL FLAT DEPOSIT)			
4.80-5.25	U4	3	4.70					
5.25	D5							
6.00-6.50	B6						6.00	
6.15-6.45	S	N2	6.00		Very loose, becoming loose, brown and grey, very silty SAND. Sand is fine grained.			
7.00-7.50	B7							
7.80-8.30	B8							
7.95-8.25	S	N8	7.50					
8.25	D6			BENEATH INSTALLATION	(MARINE SAND)			
8.90-9.40	B9			BENEATH INSTALLATION				
9.05-9.35	S	N6	8.90	BENEATH INSTALLATION				
9.35	D7			BENEATH INSTALLATION				
9.50-10.00	B10			BENEATH INSTALLATION			9.50	
10.00	W1			BENEATH INSTALLATION	Loose, brown, silty, gravelly SAND. Gravel is angular to rounded flint, quartzite and shells. (OLD BEACH DEPOSIT)		10.00	

REMARKS
1. Excavating a pit from 0.00m to 1.20m for 1.25 hours
2. Borehole cased to 12.70m depth
3. Gas monitoring standpipe installed to 8.00m depth

Project No 15840

Scale 1:50 | Page 1/2

KEY
D - Disturbed Sample
B - Bulk Sample
U - Undisturbed Sample
W - Water Sample
S/C - SPT Spoon/Cone
▽ Water Strike
▼ Water Rise
N/* - SPT Blows for 0.3m or given penetration
ES - Environmental Sample
V - Vane Shear Test
Cohesion ( ) kPa
▼c Level on completion
c▼w Level casing withdrawn
▼s Standpipe Level

Groundwater Strikes

No	Depth m Struck	Rose to	Rate	Cased	Sealed
1	9.50	4.70	steady	9.00	not
2	11.90	2.80		11.70	12.70
3	17.50		slow	12.70	not

Groundwater Observations

Date	Depth m Hole	Casing	Water
16/12/22	5.30	4.70	dry
19/12/22	5.30	4.70	5.00
19/12/22	20.00	12.70	19.00
05/01/23	8.00	1.00	1.73
12/01/23	8.00	1.00	1.65

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Site: STATION YARD, MILL DROVE SOUTH, COWBIT

BOREHOLE **BH2**

Date: 16/12/22 to 19/12/22

Hole Size: 150mm dia to 20.00m

Ground Level:

Samples and in-situ Tests			(Date) Casing	Inst.	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Blows						
				BENEATH INSTALLATION	Medium dense, brown, silty SAND AND GRAVEL. Gravel is angular to rounded flint, limestone and shells.		10.00	
10.50-11.00	B11			BENEATH INSTALLATION				
10.65-10.95	S	N27	10.50	BENEATH INSTALLATION	(OLD BEACH DEPOSIT)			
				BENEATH INSTALLATION				
11.60-11.80	B12			BENEATH INSTALLATION			11.60	
11.80-12.10	B13		2	BENEATH INSTALLATION	Soft, brown and grey, silty CLAY. (TIDAL FLAT DEPOSIT)		11.90	
11.95-12.25	S	N24	11.70	BENEATH INSTALLATION	Medium dense, brown, slightly silty SAND AND GRAVEL. Gravel is angular to sub-rounded flint, limestone and shells. (OLD BEACH DEPOSIT)		12.30	
12.00	W2			BENEATH INSTALLATION				
12.25	D8			BENEATH INSTALLATION				
12.30-12.50	B14			BENEATH INSTALLATION	Very stiff, fissured, slightly gravelly, silty CLAY. Gravel is angular to rounded chalk and flint.			
				BENEATH INSTALLATION				
13.40	D9		12.70	BENEATH INSTALLATION				
13.50-13.90	U5	50		BENEATH INSTALLATION				
				BENEATH INSTALLATION				
14.50	D10			BENEATH INSTALLATION				
15.00-15.40	U6	56	12.70	BENEATH INSTALLATION	(TILL)			
15.40	D11			BENEATH INSTALLATION				
16.00	D12			BENEATH INSTALLATION				
16.50-16.90	U7	70	12.70	BENEATH INSTALLATION				
16.95	D13			BENEATH INSTALLATION				
17.50	D14		3	BENEATH INSTALLATION			17.50	
18.00-18.30	U8	75	12.70	BENEATH INSTALLATION	Very stiff, fissured, grey, silty CLAY.			
18.30	D15			BENEATH INSTALLATION				
19.00	D16		c	BENEATH INSTALLATION				
19.70-20.00	U9	80	12.70	BENEATH INSTALLATION	(OXFORD CLAY)			
20.00	D17			BENEATH INSTALLATION			20.00	

REMARKS

Borehole completed at 20.00m depth

Project No 15840

Scale 1:50

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KEY

D - Disturbed Sample
B - Bulk Sample
U - Undisturbed Sample
W - Water Sample
S/C - SPT Spoon/Cone
▽ Water Strike
▼ Water Rise

N/* - SPT Blows for 0.3m or given penetration
ES - Environmental Sample
V - Vane Shear Test Cohesion ( ) kPa
▼c Level on completion
c▼w Level casing withdrawn
▼s Standpipe Level

Groundwater Strikes

No	Struck	Rose to	Depth m Rate	Cased	Sealed

Groundwater Observations

Date	Depth m Hole	Casing	Water
19/01/23	8.00	1.00	1.70

Borehole Number	Depth (m)	Casing Depth (m)	Depth to Water (m)	Type of Test *	Seating Drive Blows/ Penetration (mm)	Test Drive: 300mm Blows for each successive 75 mm Penetration				N Value	Extra-polated Value
BH1	3.00 - 3.45	3.00		S	1/150	1	0	0	0	1	
	4.00 - 4.45	4.00		S	1/150	0	0	1	0	1	
	5.00 - 5.45	4.70		S	1/150	1	1	1	1	4	
	6.00 - 6.45	6.00	5.70	S	1/150	1	0	1	0	2	
	7.50 - 7.95	7.50	6.00	S	1/150	0	0	0	0	0	
	9.00 - 9.45	9.00	5.00	S	1/150	1	0	0	0	1	
	10.50 - 10.88	10.50	6.00	S	7/150	12	18	22			69
	11.80 - 12.25	11.80	7.90	S	6/150	4	6	6	8	24	
BH2	1.20 - 1.65			S	1/150	1	1	0	0	2	
	6.00 - 6.45	6.00	5.00	S	1/150	0	0	1	1	2	
	7.80 - 8.25	7.50	5.00	S	1/150	1	1	3	3	8	
	8.90 - 9.35	8.90	6.00	S	1/150	0	1	2	3	6	
	10.50 - 10.95	10.50	5.00	S	3/150	3	5	7	12	27	
	11.80 - 12.25	11.70	3.00	S	6/150	4	6	7	7	24	

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* C denotes test using a solid cone
S denotes test using a split barrel sampler

Results of Standard/Cone Penetration Tests 15840

STATION YARD, MILL DROVE SOUTH, COWBIT

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Site: STATION YARD, MILL DROVE SOUTH, COWBIT

TRIAL PIT
TP1

Date: 05/01/23

Pit Size: 2.60m L x 0.45m W x 3.10m D.

Ground Level:

Samples and in-situ Tests			(Date) Water	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Result					
				MADE GROUND - Dark grey and black, sandy SILT.		0.10	
0.15	D1			MADE GROUND - Firm, dark grey and grey, slightly sandy, gravelly CLAY with occasional cobbles of brick. Gravel is angular to rounded brick, ash, flint and quartzite.			
0.15	ES1						
0.30	D2						
0.30	ES2					0.40	
				MADE GROUND - Light brown and brown, silty SAND AND GRAVEL. Gravel is sub-rounded and rounded flint, quartzite, quartz and ash.			
						0.70	
0.75	D3			Stiff, dark grey and dark brown, silty CLAY.			
0.75	V1	(90)					
			1 ▽	(TIDAL FLAT DEPOSIT)		1.05	
1.10	D4			Firm, brown, grey and orange brown, slightly sandy, silty CLAY. (TIDAL FLAT DEPOSIT)		1.20	
1.10	V2	(47)					
1.25-1.50	B1			Brown and light brown, clayey, silty, fine SAND.			
1.30	D5						
				(TIDAL FLAT DEPOSIT)		1.65	
				Soft, brown, silty CLAY.			
1.80	D6						
2.00	V3	(28)	2 ▽				
				...Becoming slightly organic below 2.40m depth.			
2.60	D7						
				(TIDAL FLAT DEPOSIT)			
3.00	V4	(25)				3.10	
				Pit completed at 3.10m depth			

KEY

- D - Disturbed Sample
- B - Bulk Sample
- U - Undisturbed Sample
- R - Root Sample
- W - Water Sample
- ES - Environmental Sample
- ▽ Water Strike
- ▼ Water Rise
- ▼c Level on completion
- MP - Mackintosh Probe
- P( ) - Hand Penetrometer Cohesion ( ) kPa
- V - Vane Shear Test Cohesion ( ) kPa

REMARKS

1. Live roots observed to 0.20m depth
2. Water seepage at 1.05m depth
3. Water seepage at 2.00m depth
4. Pit sides stable

Project No 15840

Scale 1:25

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Site: STATION YARD, MILL DROVE SOUTH, COWBIT

TRIAL PIT
TP2

Date: 05/01/23

Pit Size: 1.20m L x 0.30m W x 1.00m D.

Ground Level:

Samples and in-situ Tests			(Date) Water	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Result					
0.05	D1			MADE GROUND - Dark grey and black, slightly gravelly, silty SAND with occasional organic matter. Gravel is angular asphalt and ash.		0.09	
0.05	ES1						
0.20	D2			MADE GROUND - Orange brown SAND AND GRAVEL. Gravel is angular to rounded quartzite and flint.		0.30	
0.20	ES2						
0.35	D3			MADE GROUND - Firm, dark brown and grey, slightly sandy, silty CLAY with rare brick fragments.		0.40	
0.35	V1	(69)					
				Firm, dark grey and dark brown, silty CLAY.			
0.60	D4						
0.70	V2	(66)		(TIDAL FLAT DEPOSIT)		0.85	
				Firm, brown, orange brown and light grey, slightly sandy, silty CLAY. (TIDAL FLAT DEPOSIT)		1.00	
1.00	D5						
1.00	V3	(61)		Pit completed at 1.00m depth			

KEY

- D - Disturbed Sample
- B - Bulk Sample
- U - Undisturbed Sample
- R - Root Sample
- W - Water Sample
- ES - Environmental Sample
- ▽ Water Strike
- ▼ Water Rise
- ▼c Level on completion
- MP - Mackintosh Probe
- P( ) - Hand Penetrometer Cohesion ( ) kPa
- V - Vane Shear Test Cohesion ( ) kPa

REMARKS

1. Live roots observed to 0.35m depth
2. Pit dry
3. Pit sides stable
4. Soakaway test undertaken at 1.00m depth

Project No	
15840	
Scale	Page
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SOAKAWAY TEST RESULTS

BRE DIGEST 365 - SOIL INFILTRATION RATE

Project: Station Yard, Mill Drove South, Cowbit
Client: Seagate Homes

Project No: C15840
Sheet No: 1/1

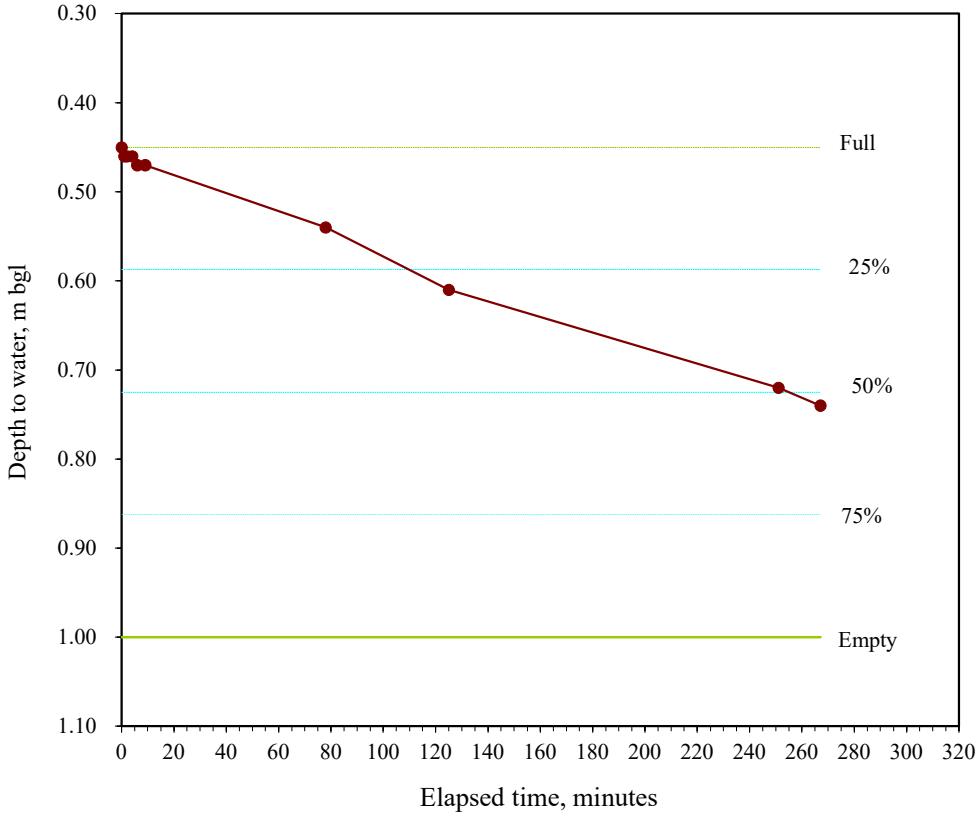
Trial Pit: TP2 FIRST FILLING
Depth: 1.00
Length: 1.20
Width: 0.30

Description of Stratum under test: Firm, silty CLAY to 0.85m depth over firm, slightly sandy, silty CLAY

Depth to water prior to test: (below ground level) Dry

Elapsed Time min	Depth to Water m
0	0.45
1	0.46
2	0.46
4	0.46
6	0.47
9	0.47
78	0.54
125	0.61
251	0.72
267	0.74

DEPTH TO WATER vs ELAPSED TIME



All dimensions given in metres

f = (V75-V25)/A50(T75-T25)

V75-V25 = 0.099
A50 = 1.185
T75-T25 = 333 (extrapolated)

Extrapolated Soil Infiltration Rate **f = 4.18E-06 m/s**

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Site: STATION YARD, MILL DROVE SOUTH, COWBIT

TRIAL PIT
TP3

Date: 05/01/23

Pit Size: 2.60m L x 0.45m W x 3.00m D.

Ground Level:

Samples and in-situ Tests			(Date) Water	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Result					
0.10	D1			MADE GROUND - Dark grey and black, silty, gravelly SAND with occasional organic matter. Gravel is angular to rounded flint, quartzite, ash and brick fragments.		0.15	
0.10	ES1						
0.20	D2			MADE GROUND - Light brown SAND AND GRAVEL. Gravel is angular to rounded flint, quartzite and brick fragments.		0.55	
0.20	ES2						
0.60-0.80	B1			Firm, light grey and dark brown, silty CLAY.			
0.65	D3						
0.70	V1	(63)		(TIDAL FLAT DEPOSIT)		0.90	
1.00	D4			Firm, brown and grey, slightly sandy, silty CLAY with rare shell fragments.			
1.10	V2	(54)					
				(TIDAL FLAT DEPOSIT)		1.45	
1.50	V3	(64)		Firm, becoming soft, dark brown, red brown and grey, silty, organic CLAY with bands of pseudofibrous peat below 1.80m depth.			
1.55	D5						
1.70	D6						
1.85	D7						
2.00	V4	(22)					
2.20	D8						
			1 ▽				
				...Becoming very soft below 2.65m depth.			
				(TIDAL FLAT DEPOSIT)			
			▼c				
3.00	D9					3.00	
3.00	V5	(17)		Pit completed at 3.00m depth			

KEY

- D - Disturbed Sample
- B - Bulk Sample
- U - Undisturbed Sample
- R - Root Sample
- W - Water Sample
- ES - Environmental Sample
- ▽ Water Strike
- ▼ Water Rise
- ▼c Level on completion
- MP - Mackintosh Probe
- P( ) - Hand Penetrometer Cohesion ( ) kPa
- V - Vane Shear Test Cohesion ( ) kPa

REMARKS

1. Live roots observed to 0.60m depth
2. Water seepage at 2.40m depth
3. Water standing at 2.90m on completion
4. Pit sides stable

Project No 15840

Scale 1:25

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Site: STATION YARD, MILL DROVE SOUTH, COWBIT

TRIAL PIT
TP5

Date: 05/01/23

Pit Size: 2.50m L x 0.45m W x 3.10m D.

Ground Level:

Samples and in-situ Tests			(Date) Water	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Result					
0.05	D1			MADE GROUND – Firm, friable, dark grey and grey, slightly sandy, slightly gravelly, silty CLAY with occasional organic matter. Gravel is sub-angular and sub-rounded quartz and plastic.		0.10	
0.05	ES1						
0.25	D2			Firm, grey, brown and orange brown, slightly sandy, silty CLAY.			
0.50-0.80	B1						
0.55	D3						
0.55	V1	(64)					
0.80	V2	(69)					
0.85	D4						
0.95	V3	(42)					
1.00	D5			(TIDAL FLAT DEPOSIT)			
			1 ▽			1.50	
1.55	D6			Very soft, brown and grey, silty, slightly organic CLAY with bands of amorphous peat below 1.80m depth.			
1.55	V4	(18)					
1.90	D7						
2.00	V5	(13)					
2.30	D8			(TIDAL FLAT DEPOSIT)			
			▼c			3.10	
3.10	D9						
3.10	V6	(15)		Pit completed at 3.10m depth			

KEY
- D - Disturbed Sample
- B - Bulk Sample
- U - Undisturbed Sample
- R - Root Sample
- W - Water Sample
- ES - Environmental Sample
- ▽ Water Strike
- ▼ Water Rise
- ▼c Level on completion
- MP - Mackintosh Probe
- P( ) - Hand Penetrometer Cohesion ( ) kPa
- V - Vane Shear Test Cohesion ( ) kPa

REMARKS
1. Live roots observed to 1.10m depth
2. Water seepage at 1.53m depth
3. Water standing at 3.05m on completion
4. Pit sides stable

Project No 15840

Scale 1:25

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Site: STATION YARD, MILL DROVE SOUTH, COWBIT

TRIAL PIT
TP6

Date: 05/01/23

Pit Size: 2.50m L x 0.45m W x 3.10m D.

Ground Level:

Samples and in-situ Tests			(Date) Water	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Result					
				MADE GROUND - Dark grey, gravelly SAND with occasional organic matter.		0.10	
0.25	D1			MADE GROUND - Light brown, slightly silty SAND AND GRAVEL. Gravel is sub-angular to rounded quartz, flint and quartzite.			
0.25	ES1					0.55	
0.60	D2			Firm, brown, grey and orange brown, silty CLAY. (TIDAL FLAT DEPOSIT)			
0.65	V1	(56)				0.80	
0.85	D3			Soft, light grey and orange brown, sandy SILT/CLAY. Sand is fine grained. (TIDAL FLAT DEPOSIT)		0.90	
0.85	V2	(30)		Light brown and orange brown, silty, fine SAND.			
0.95-1.25	B1						
1.05	D4			(TIDAL FLAT DEPOSIT)		1.30	
1.40	V3	(31)		Soft, light grey, brown and orange brown, slightly sandy, silty CLAY.			
1.45	D5						
				...Becoming slightly organic below 1.85m depth.			
2.00	D6						
2.10	V4	(25)		(TIDAL FLAT DEPOSIT)		2.35	
2.45	D7			Very soft, blue grey, silty, organic CLAY with bands of amorphous PEAT.			
			▽ 1				
				(TIDAL FLAT DEPOSIT)		3.10	
3.10	D8						
3.10	V5	(17)		Pit completed at 3.10m depth			

KEY

- D - Disturbed Sample
- B - Bulk Sample
- U - Undisturbed Sample
- R - Root Sample
- W - Water Sample
- ES - Environmental Sample
- ▽ Water Strike
- ▼ Water Rise
- ▼c Level on completion
- MP - Mackintosh Probe
- P( ) - Hand Penetrometer Cohesion ( ) kPa
- V - Vane Shear Test Cohesion ( ) kPa

REMARKS

1. Live roots observed to 1.40m depth
2. Water seepage at 2.80m depth
3. Pit dry on completion
4. Pit sides stable

Project No 15840

Scale 1:25

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Groundwater & Gas Monitoring Record

Site: Station Yard, Mill Drive South, Cowbit

Report Ref: C15840

Date	Borehole No.	Methane (% v/v)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		Flow Rate (l/hr)	Atmosph. Pressure (mb)	Depth of Well (mbgl)	Depth to Groundwater (mbgl)	Comments
		Peak	Steady	Peak	Steady	Min.	Max.					
05/01/2023	BH1	<0.1	<0.1	0.6	0.6	20.0	20.0	<0.1	1017	7.00	1.85	
05/01/2023	BH2	<0.1	<0.1	3.9	3.9	16.2	16.2	<0.1	1018	7.00	1.73	
12/01/2023	BH1	<0.1	<0.1	0.8	0.8	18.5	18.5	<0.1	1001	7.00	1.78	Water Sample Taken
12/01/2023	BH2	<0.1	<0.1	4.9	4.9	15.0	15.0	<0.1	1001	7.00	1.65	Water Sample Taken
20/01/2023	BH1	<0.1	<0.1	1.8	1.8	18.6	18.6	<0.1	1016	7.00	1.81	
20/01/2023	BH2	<0.1	<0.1	3.2	3.2	18.0	18.0	<0.1	1016	7.00	1.70	

LEL – Lower Explosive Limit

LABORATORY TEST RESULTS

CONTRACT STATION YARD, MILL DROVE SOUTH, COWBIT

Bore-hole	Sample	Depth m	Classification				Density		Triaxial Compression					Sulphates (SO_4)				C.B.R.		Remarks
			Liquid Limit %	Plastic Limit %	Plasticity Index %	Moisture Content %	Bulk Mg/m^3	Dry Mg/m^3	Type	Principal Stress Difference kPa	Cell Pressure kPa	Shear Strength kPa	Angle of Shear Resistance degrees	Soil Total % Dry Wt.	Soil Aqueous Extract mg/l	Water mg/l	pH	Top %	Base %	
BH1	U1	1.20 - 1.65	52	22	30	30	1.91	1.46	Q	52	50	26	0							SOIL CLASSIFICATION = CH 1% retained on 425μm sieve
	W2	1.78														222	7.7			
	U2	2.00 - 2.30				31	1.97	1.50	Q	29	50	14	0		338		7.6			
	W3	7.50														280	7.9			
	U3	13.50 - 13.95				19	2.18	1.83	Q	280	240	140	0							
	U4	15.00 - 15.30				16	2.16	1.86	Q	281	270	140	0							
	U5	16.50 - 16.90				16	2.11	1.81	Q	376	300	188	0							
	U6	18.00 - 18.40				20	2.16	1.80	Q	390	320	195	0							
	U7	19.50 - 19.95				20	2.11	1.76	Q	428	350	214	0							
BH2	B3	0.50 - 1.00				24	1.92	1.54										0.3	0.4	1% retained on 20mm sieve
	W3	1.65														1111	7.3			

U - UNDISTURBED SAMPLE
D - DISTURBED SAMPLE
B - BULK SAMPLE
W - WATER SAMPLE

C.U. - CONSOLIDATED UNDRAINED
C.D. - CONSOLIDATED DRAINED
Q. - IMMEDIATE UNDRAINED
Q.M. - IMMEDIATE UNDRAINED MULTISTAGE

Aqueous Extract 2:1 Water:Soil

C.B.R. - CALIFORNIA BEARING RATIO

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LABORATORY TEST RESULTS

CONTRACT STATION YARD, MILL DROVE SOUTH, COWBIT

Bore-hole	Sample	Depth m	Classification				Density		Triaxial Compression					Sulphates (SO_4)				C.B.R.		Remarks
			Liquid Limit %	Plastic Limit %	Plasticity Index %	Moisture Content %	Bulk Mg/m^3	Dry Mg/m^3	Type	Principal Stress Difference kPa	Cell Pressure kPa	Shear Strength kPa	Angle of Shear Resistance degrees	Soil: Total % Dry Wt.	Soil: Aqueous Extract mg/l	Water mg/l	pH	Top %	Base %	
BH2	U1	2.00 - 2.45	115	42	73	78	1.56	0.88	Q	33	50	17	0							SOIL CLASSIFICATION = CE 0% retained on 425µm sieve
	U2	3.00 - 3.45				67	1.63	0.98	Q	12	50	6	0							
	U3	4.00 - 4.45				56	1.76	1.13	Q	8	70	4	0							
	U4	4.80 - 5.25				61	1.77	1.10	Q	8	90	4	0							
	U5	13.50 - 13.90				15	2.23	1.93	Q	624	240	312	0							
	U6	15.00 - 15.40				17	2.20	1.88	Q	395	270	198	0							
	U7	16.50 - 16.90				23	2.08	1.69	Q	280	300	140	0							
	U8	18.00 - 18.30				22	2.23	1.83	Q	530	320	265	0							
	U9	19.70 - 20.00				24	2.23	1.80	Q	395	350	197	0							

U - UNDISTURBED SAMPLE
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Q. - IMMEDIATE UNDRAINED
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Aqueous Extract 2:1 Water:Soil

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LABORATORY TEST RESULTS

CONTRACT STATION YARD, MILL DROVE SOUTH, COWBIT

Trial-pit	Sample	Depth m	Classification				Density		Triaxial Compression					Sulphates (SO_4)				C.B.R.		Remarks
			Liquid Limit %	Plastic Limit %	Plasticity Index %	Moisture Content %	Bulk Mg/m^3	Dry Mg/m^3	Type	Principal Stress Difference kPa	Cell Pressure kPa	Shear Strength kPa	Angle of Shear Resistance degrees	Soil: Total % Dry Wt.	Soil: Aqueous Extract mg/l	Water mg/l	pH	Top %	Base %	
TP1	D4	1.10	41	24	17	30														SOIL CLASSIFICATION = CI 0% retained on 425µm sieve
	D5	1.30													123		8.2			
	D7	2.60													385		7.6			
TP2	D5	1.00	39	22	17	25														SOIL CLASSFICATION = CI 0% retained on 425µm sieve
TP3	B1	0.60 - 0.80				35	1.72	1.25										0.9	1.0	0% retained on 20mm sieve
	D4	1.00	45	25	20	33														SOIL CLASSIFICATION = CI 0% retained on 425µm sieve
	D5	1.55													2404		7.3			
	D6	1.70	138	91	47	105														SOIL CLASSIFICATION = MEO 0% retained on 425µm sieve
	D7	1.85													1161		7.2			
TP5	D4	0.85	56	25	31	28														SOIL CLASSIFICATION = CH 0% retained on 425µm sieve

U - UNDISTURBED SAMPLE
D - DISTURBED SAMPLE
B - BULK SAMPLE
W - WATER SAMPLE

C.U. - CONSOLIDATED UNDRAINED
C.D. - CONSOLIDATED DRAINED
Q. - IMMEDIATE UNDRAINED
Q.M. - IMMEDIATE UNDRAINED MULTISTAGE

Aqueous Extract 2:1 Water:Soil

C.B.R. - CALIFORNIA BEARING RATIO

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LABORATORY TEST RESULTS

CONTRACT STATION YARD, MILL DROVE SOUTH, COWBIT

Trial-pit	Sample	Depth m	Classification				Density		Triaxial Compression					Sulphates (SO_4)				C.B.R.		Remarks
			Liquid Limit %	Plastic Limit %	Plasticity Index %	Moisture Content %	Bulk Mg/m^3	Dry Mg/m^3	Type	Principal Stress Difference kPa	Cell Pressure kPa	Shear Strength kPa	Angle of Shear Resistance degrees	Soil: Total % Dry Wt.	Soil: Aqueous Extract mg/l	Water mg/l	pH	Top %	Base %	
TP5	D5	1.00													72		7.8			
TP6	D3	0.85	35	24	11	25														SOIL CLASSIFICATION = CL/CI/ML/MI 0% retained on 425μm sieve

U – UNDISTURBED SAMPLE
D – DISTURBED SAMPLE
B – BULK SAMPLE
W – WATER SAMPLE

C.U. – CONSOLIDATED UNDRAINED
C.D. – CONSOLIDATED DRAINED
Q. – IMMEDIATE UNDRAINED
Q.M. – IMMEDIATE UNDRAINED MULTISTAGE

Aqueous Extract 2:1 Water:Soil

C.B.R. – CALIFORNIA BEARING RATIO

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www.groundengineering.co.uk

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GROUND ENGINEERING LIMITED

Newark Road Peterborough
t: 01733 566566
e: admin@groundengineering.co.uk

TEST CERTIFICATE

Determination of Particle Size Distribution

Tested in Accordance with BS 1377-2: 1990: Clause 9.2 & 9.4
Wet Sieving Method and Sedimentation by Pipette

Client:	Ground Engineering Ltd	Certificate Number:	PL8119-1/3/710-2
Client Address:	Newark Road	Client Reference:	C15840
	Peterborough	Lab Job Number:	PL8119-1
	PE1 5UA	Date Sampled:	Unknown
		Date Received:	11.01.2023
Contact:	Simon Weatherley	Date Tested:	18.01.2023
		Certificate of Sampling:	N/A
Site Name:	Station Yard	Sampling Certificate No.:	N/A
Site Address:	Mill Drove South, Cowbit	Sampled By:	Client

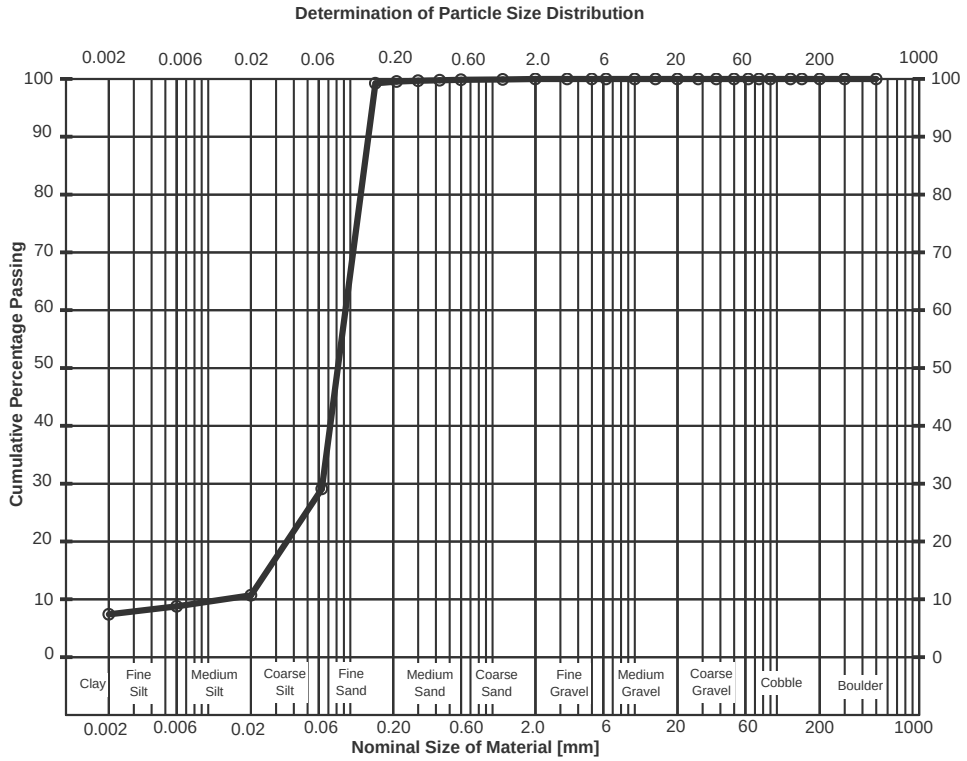
TEST RESULTS

Laboratory Reference: PL8119-1/3
Client Reference: B10
Pre-treatment for organic material: N/A

Sample Description: Brown grey slightly silty slightly organic SAND.

Material Specification: Not Required
Location: BH1
Source:

Depth Top: 7.50m
Depth Base: 8.00m
Supplier:



Sieve Analysis

Sieve mm	%Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	100
14	100
10	100
6.3	100
5.0	100
3.35	100
2.00	100
1.18	100
0.600	100
0.425	100
0.300	100
0.212	100
0.150	99
0.063	29
0.020	**11**
0.006	**9**
0.002	**7**

Comments: Data relevant to material below 63 microns is outside the current scope of UKAS accreditation

Approved Signatory: M. Hartnup - Laboratory Manager

Signed:

for and on behalf of Ground Engineering Ltd

Date Reported: 01.02.2023 Page 1 of 1
Form Number: GELab/C/709-2 Version 57

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Registration Number: 6929574
Reg Office: Ground Engineering Ltd
Newark Rd, Peterborough PE1 5UA

GROUND ENGINEERING LIMITED

Newark Road Peterborough
t: 01733 566566
e: admin@groundengineering.co.uk

8180

TEST CERTIFICATE

Determination of Particle Size Distribution

Tested in Accordance with BS 1377-2: 1990: Clause 9.2
Wet Sieving Method

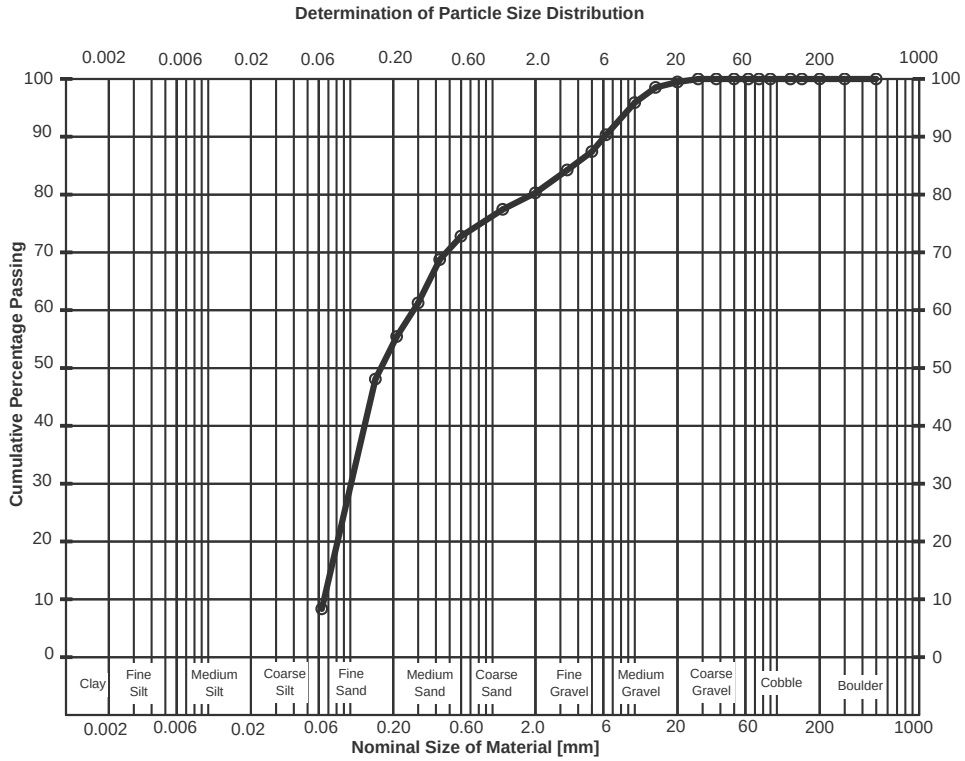
Client:	Ground Engineering Ltd	Certificate Number:	PL8119-1/5/710-2
Client Address:	Newark Road	Client Reference:	C15840
	Peterborough	Lab Job Number:	PL8119-1
	PE1 5UA	Date Sampled:	Unknown
		Date Received:	11.01.2023
Contact:	Simon Weatherley	Date Tested:	18.01.2023
		Certificate of Sampling:	N/A
Site Name:	Station Yard	Sampling Certificate No.:	N/A
Site Address:	Mill Drove South, Cowbit	Sampled By:	Client

TEST RESULTS

Laboratory Reference: PL8119-1/5
Client Reference: B13
Pre-treatment for organic material: N/A

Sample Description: Grey brown slightly silty gravelly SAND. Gravel consists of fine to medium angular to sub-rounded flint quartzite and shell fragments.

Material Specification: Not Required
Location: BH1
Source:
Depth Top: 10.50m
Depth Base: 11.00m
Supplier:



Sieve Analysis

Sieve mm	%Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	99
14	99
10	96
6.3	90
5.0	87
3.35	84
2.00	80
1.18	77
0.600	73
0.425	69
0.300	61
0.212	55
0.150	48
0.063	8
0.020	
0.006	
0.002	

Comments:

Approved Signatory: M. Hartnup - Laboratory Manager

Signed:

for and on behalf of Ground Engineering Ltd

Date Reported: 01.02.2023 Page 1 of 1
Form Number: GELab/C/709-2 Version 57

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Newark Rd, Peterborough PE1 5UA

GROUND ENGINEERING LIMITED

Newark Road Peterborough

t:01733 566566

e: admin@groundengineering.co.uk

TEST CERTIFICATE

One-Dimensional Consolidation Properties

(Tested in accordance with BS1377 : Part 5 1990)

Client:	Ground Engineering Ltd	Certificate Number:	PL8119-1-1/731
Client Address:	Newark Road	Client Reference Number:	C15840
	Peterborough	Date Sampled:	Unknown
	Cambridgeshire	Date Received:	11.01.2023
Postcode:	PE1 5UA	Date Tested:	20.01.2023
Contact:	Simon Weatherley	Sampling Certificate No:	N/A
Site Name:	Station Road	Certificate of Sampling:	N/A
Site Address:	Mill Drove South, Cowbit	Sampled By:	Client

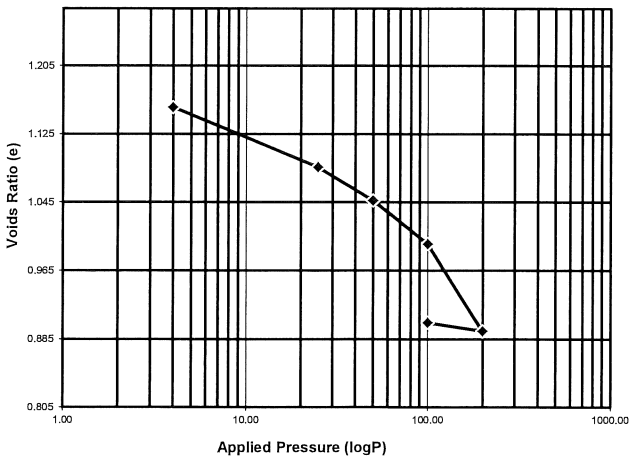
Test Details

Location:	BH1	
Sample Ref:	U1	
Sample Description:	Soft brown grey orange-brown slightly silty CLAY.	
Particle Density (Mg/m^3):	2.7	Assumed
Mean Lab Temp. ($^{\circ}C$):	22	
Variations from Standard:	None	
Lab Reference:	PL8119-1-1	
Depth:	1.60 m	

Specimen Details

	INITIAL	FINAL
Height (mm):	18.91	16.70
Bulk Density (Mg/m^3):	1.75	1.93
Moisture Content (%):	40	36
Dry Density (Mg/m^3):	1.25	1.42
Voids Ratio:	1.156	0.904
Degree of Saturation (%):	93.5	100.0
Diameter (mm):	74.96	N/A
Swelling Pressure (kPa):	4	N/A
Method of time fitting used:	Log Time	N/A

Voids Ratio against logarithm of Applied Pressure



Applied Pressure (kPa)	Coefficient of Compressibility m_v (m^2/MN)	Coefficient of Consolidation c_v (m^2/year)
4		
25	1.55	2.13
50	0.74	0.76
100	0.50	1.28
200	0.51	0.98
100	0.06	---

Comments:

Approved Signatory: [x] M.Hartnup - Laboratory Manager
[ ] L.Petch - Team Leader

Signed:

for and on behalf of Ground Engineering Ltd

Date Reported: 02/02/2023

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Peterborough PE1 5UA

GROUND ENGINEERING LIMITED

Newark Road Peterborough

t:01733 566566

e: admin@groundengineering.co.uk

TEST CERTIFICATE

One-Dimensional Consolidation Properties

(Tested in accordance with BS1377 : Part 5 1990)

Client:	Ground Engineering Ltd	Certificate Number:	PL8119-1-13/731
Client Address:	Newark Road	Client Reference Number:	C15840
	Peterborough	Date Sampled:	Unknown
	Cambridgeshire	Date Received:	11.01.2023
Postcode:	PE1 5UA	Date Tested:	20.01.2023
Contact:	Simon Weatherley	Sampling Certificate No:	N/A
Site Name:	Station Road	Certificate of Sampling:	N/A
Site Address:	Mill Drove South, Cowbit	Sampled By:	Client

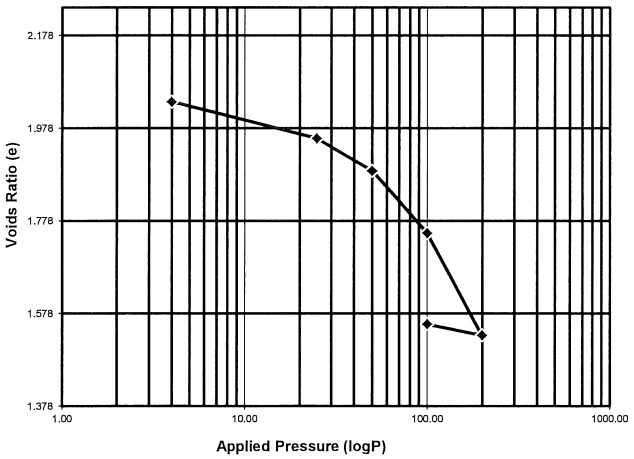
Test Details

Location:	BH2	
Sample Ref:	U1	
Sample Description:	Soft grey orange-brown dark-brown brown yellow slightly silty slightly organic CLAY with small peaty pockets and rare sandy pockets.	
Particle Density (Mg/m^3):	2.5	Assumed
Mean Lab Temp. ($^{\circ}C$):	22	
Variations from Standard:	None	
Lab Reference:	PL8119-1-13	
Depth:	2.10 m	

Specimen Details

	INITIAL	FINAL
Height (mm):	19.02	16.02
Bulk Density (Mg/m^3):	1.47	1.63
Moisture Content (%):	78	67
Dry Density (Mg/m^3):	0.82	0.98
Voids Ratio:	2.035	1.556
Degree of Saturation (%):	95.8	100.0
Diameter (mm):	74.95	N/A
Swelling Pressure (kPa):	4	N/A
Method of time fitting used:	Log Time	N/A

Voids Ratio against logarithm of Applied Pressure



Applied Pressure (kPa)	Coefficient of Compressibility m_v (m^2/MN)	Coefficient of Consolidation c_v (m^2/year)
4		
25	1.24	3.99
50	0.94	0.54
100	0.93	0.97
200	0.80	0.93
100	0.10	---

Comments:

Approved Signatory: [x] M.Hartnup - Laboratory Manager
[ ] L.Petch - Team Leader

Signed:

for and on behalf of Ground Engineering Ltd

Date Reported: 02/02/2023

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Registered in England Wales
Reg Number 6929574
Reg Office: Ground Engineering Ltd
Newark Rd
Peterborough PE1 5UA

eurofins | Chemtest
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	23-00737-1
Initial Date of Issue:	23-Jan-2023
Client	Ground Engineering Limited
Client Address:	Newark Road Peterborough Cambridgeshire PE1 5UA
Contact(s):	Simon Weatherley
Project	SW1C15840 STATION YARD, COWBIT

Quotation No.:	Q22-29833	**Date Received:**	12-Jan-2023
Order No.:	SW1C15840	**Date Instructed:**	12-Jan-2023
No. of Samples:	9		
Turnaround (Wkdays):	10	**Results Due:**	25-Jan-2023
Date Approved:	23-Jan-2023		

Approved By:



Details: Stuart Henderson, Technical Manager

Results - Soil

Project: SW1C15840 STATION YARD, COWBIT

Client: Ground Engineering Limited		**Chemtest Job No.:**			23-00737	23-00737	23-00737	23-00737	23-00737	23-00737	23-00737	23-00737
Quotation No.: Q22-29833		**Chemtest Sample ID.:**			1572379	1572380	1572381	1572382	1572383	1572384	1572385	1572386
Order No.: SW1C15840		Client Sample Ref.:			D1	D1	D1	D2	D1	D1	B1	B1
		Sample Location:			TP1	TP2	TP3	TP3	TP5	TP6	BH1	BH2
		Sample Type:			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):			0.15	0.05	0.1	0.2	0.05	0.25	0.0	0.0
		Bottom Depth (m):									0.3	0.3
		Date Sampled:			05-Jan-2023	05-Jan-2023	05-Jan-2023	05-Jan-2023	05-Jan-2023	05-Jan-2023	05-Jan-2023	05-Jan-2023
		Asbestos Lab:			DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**								
pH	M	2010		4.0	8.0	7.8	7.6	8.1	7.9	8.2	7.8	7.8
Moisture	N	2030	%	0.020	14	18	22	11	27	5.4	18	13
Stones and Removed Materials	N	2030	%	0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	1.9	2.3	3.6	0.81	11	< 0.40	0.53	1.9
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	0.015	0.30
Cyanide (Free)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50	6.9	7.3	5.1	4.7	1.3	1.6	4.0	160
Arsenic	M	2455	mg/kg	0.5	19	9.7	18	9.9	8.0	32	20	22
Cadmium	M	2455	mg/kg	0.10	0.16	0.14	0.18	< 0.10	0.21	0.14	0.16	0.18
Chromium	M	2455	mg/kg	0.5	16	11	19	11	12	26	17	32
Copper	M	2455	mg/kg	0.50	29	20	28	16	18	16	24	85
Mercury	M	2455	mg/kg	0.05	0.09	0.09	0.09	< 0.05	0.16	< 0.05	0.08	0.15
Nickel	M	2455	mg/kg	0.50	17	11	19	11	12	32	17	23
Lead	M	2455	mg/kg	0.50	56	59	46	30	57	14	62	53
Selenium	M	2455	mg/kg	0.25	0.77	0.62	0.79	0.35	0.53	1.0	0.85	2.2
Zinc	M	2455	mg/kg	0.50	85	55	82	37	88	72	61	77
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	8.9	16	10	3.0	0.64	0.52	20	11
Acenaphthene	M	2790	mg/kg	0.50								
Acenaphthene	M	2700	mg/kg	0.10	0.42	2.8	0.19	0.10	< 0.10	< 0.10	1.5	0.18
Acenaphthylene	M	2790	mg/kg	0.50								
Acenaphthylene	M	2700	mg/kg	0.10	0.41	2.8	0.22	0.14	< 0.10	< 0.10	3.8	0.20
Anthracene	M	2790	mg/kg	0.50								
Anthracene	M	2700	mg/kg	0.10	1.6	12	0.92	0.26	0.30	< 0.10	4.9	0.66
Benzo[a]anthracene	M	2790	mg/kg	0.50								
Benzo[a]anthracene	M	2700	mg/kg	0.10	6.1	33	2.8	0.55	0.82	< 0.10	15	0.75
Benzo[a]pyrene	M	2790	mg/kg	0.50								
Benzo[a]pyrene	M	2700	mg/kg	0.10	6.3	33	3.5	0.73	1.1	< 0.10	23	0.91
Benzo[b]fluoranthene	M	2790	mg/kg	0.50								
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	8.4	41	4.6	0.92	0.99	< 0.10	31	1.2
Benzo[g,h,i]perylene	M	2790	mg/kg	0.50								
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	3.9	18	3.3	< 0.10	< 0.10	< 0.10	14	< 0.10
Benzo[k]fluoranthene	M	2790	mg/kg	0.50								
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	3.1	16	1.8	0.29	0.41	< 0.10	11	0.41
Chrysene	M	2790	mg/kg	0.50								
Chrysene	M	2700	mg/kg	0.10	8.1	37	3.4	1.0	1.9	< 0.10	20	1.2

Results - Soil

Project: SW1C15840 STATION YARD, COWBIT

Client: Ground Engineering Limited		**Chemtest Job No.:**			23-00737	23-00737	23-00737	23-00737	23-00737	23-00737	23-00737	23-00737
Quotation No.: Q22-29833		**Chemtest Sample ID.:**			1572379	1572380	1572381	1572382	1572383	1572384	1572385	1572386
Order No.: SW1C15840		Client Sample Ref.:			D1	D1	D1	D2	D1	D1	B1	B1
		Sample Location:			TP1	TP2	TP3	TP3	TP5	TP6	BH1	BH2
		Sample Type:			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):			0.15	0.05	0.1	0.2	0.05	0.25	0.0	0.0
		Bottom Depth (m):									0.3	0.3
		Date Sampled:			05-Jan-2023	05-Jan-2023	05-Jan-2023	05-Jan-2023	05-Jan-2023	05-Jan-2023	05-Jan-2023	05-Jan-2023
		Asbestos Lab:			DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**								
Dibenz(a,h)Anthracene	M	2790	mg/kg	0.50								
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	1.0	5.2	0.63	< 0.10	< 0.10	< 0.10	4.4	< 0.10
Fluoranthene	M	2790	mg/kg	0.50								
Fluoranthene	M	2700	mg/kg	0.10	12	77	6.0	1.2	1.9	< 0.10	33	1.7
Fluorene	M	2790	mg/kg	0.50								
Fluorene	M	2700	mg/kg	0.10	0.42	3.9	0.19	0.10	< 0.10	< 0.10	1.5	0.31
Indeno(1,2,3-c,d)Pyrene	M	2790	mg/kg	0.50								
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	4.3	21	2.6	< 0.10	< 0.10	< 0.10	17	< 0.10
Naphthalene	M	2790	mg/kg	0.50								
Naphthalene	M	2700	mg/kg	0.10	1.0	1.9	0.52	0.32	< 0.10	< 0.10	7.2	1.3
Phenanthrene	M	2790	mg/kg	0.50								
Phenanthrene	M	2700	mg/kg	0.10	4.5	36	2.4	0.51	0.92	< 0.10	9.5	1.2
Pyrene	M	2790	mg/kg	0.50								
Pyrene	M	2700	mg/kg	0.10	12	73	6.3	1.3	1.7	< 0.10	38	1.9
Total Of 16 PAH's	M	2700	mg/kg	2.0	74	410	39	7.4	10	< 2.0	230	12
Total Phenols	M	2920	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.12	< 0.10
ACM Type	U	2192		N/A	-	-	-	-	-	-	-	-
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones and Roots	Stones, Roots and Wood	Stones	Stones and Roots	Stones	Stones and Roots	Stones and Roots
Soil Texture	N	2040		N/A	Sand	Sand	Sand	Sand	Loam	Sand	Loam	Loam
Electrical Conductivity (2:1)	N	2020	µS/cm	1.0								
Redox Potential	N	2150	mV	N/A								
Aliphatic VPH >C5-C6	M	2780	mg/kg	0.05								
Aliphatic VPH >C6-C7	M	2780	mg/kg	0.05								
Aliphatic VPH >C7-C8	M	2780	mg/kg	0.05								
Aliphatic VPH >C8-C10	M	2780	mg/kg	0.05								
Total Aliphatic VPH >C5-C10	M	2780	mg/kg	0.25								
Aliphatic EPH >C10-C12	M	2690	mg/kg	2.00								
Aliphatic EPH >C12-C16	M	2690	mg/kg	1.00								
Aliphatic EPH >C16-C21	M	2690	mg/kg	2.00								
Aliphatic EPH >C21-C35	M	2690	mg/kg	3.00								
Aliphatic EPH >C35-C40	N	2690	mg/kg	1.00								
Total Aliphatic EPH >C10-C35	M	2690	mg/kg	5.00								
Aromatic VPH >C5-C7	M	2780	mg/kg	0.05								

Results - Soil

Project: SW1C15840 STATION YARD, COWBIT

Client: Ground Engineering Limited					**Chemtest Job No.:**	23-00737	23-00737	23-00737	23-00737	23-00737	23-00737	23-00737
Quotation No.: Q22-29833					**Chemtest Sample ID.:**	1572379	1572380	1572381	1572382	1572383	1572384	1572385	1572386
Order No.: SW1C15840					Client Sample Ref.:	D1	D1	D1	D2	D1	D1	B1	B1
					Sample Location:	TP1	TP2	TP3	TP3	TP5	TP6	BH1	BH2
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	0.15	0.05	0.1	0.2	0.05	0.25	0.0	0.0
					Bottom Depth (m):							0.3	0.3
					Date Sampled:	05-Jan-2023	05-Jan-2023	05-Jan-2023	05-Jan-2023	05-Jan-2023	05-Jan-2023	05-Jan-2023	05-Jan-2023
					Asbestos Lab:	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
Aromatic VPH >C7-C8	M	2780	mg/kg	0.05									
Aromatic VPH >C8-C10	M	2780	mg/kg	0.05									
Total Aromatic VPH >C5-C10	M	2780	mg/kg	0.25									
Aromatic EPH >C10-C12	M	2690	mg/kg	1.00									
Aromatic EPH >C12-C16	M	2690	mg/kg	1.00									
Aromatic EPH >C16-C21	N	2690	mg/kg	2.00									
Aromatic EPH >C21-C35	M	2690	mg/kg	2.00									
Aromatic EPH >C35-C40	N	2690	mg/kg	1.00									
Total Aromatic EPH >C10-C35	M	2690	mg/kg	5.00									
Total VPH >C5-C10	M	2780	mg/kg	0.50									
Total EPH >C10-C35	M	2690	mg/kg	10.00									
Total TPH >C6-C40	M	2670	mg/kg	10	140	1500	430	130	140	< 10	180	350
Dichlorodifluoromethane	U	2760	µg/kg	1.0									
Chloromethane	M	2760	µg/kg	1.0									
Vinyl Chloride	M	2760	µg/kg	1.0									
Bromomethane	M	2760	µg/kg	20									
Chloroethane	U	2760	µg/kg	2.0									
Trichlorofluoromethane	M	2760	µg/kg	1.0									
1,1-Dichloroethene	M	2760	µg/kg	1.0									
Trans 1,2-Dichloroethene	M	2760	µg/kg	1.0									
1,1-Dichloroethane	M	2760	µg/kg	1.0									
cis 1,2-Dichloroethene	M	2760	µg/kg	1.0									
Bromochloromethane	U	2760	µg/kg	5.0									
Trichloromethane	M	2760	µg/kg	1.0									
1,1,1-Trichloroethane	M	2760	µg/kg	1.0									
Tetrachloromethane	M	2760	µg/kg	1.0									
1,1-Dichloropropene	U	2760	µg/kg	1.0									
Benzene	M	2760	µg/kg	1.0									
1,2-Dichloroethane	M	2760	µg/kg	2.0									
Trichloroethene	N	2760	µg/kg	1.0									
1,2-Dichloropropane	M	2760	µg/kg	1.0									
Dibromomethane	M	2760	µg/kg	1.0									
Bromodichloromethane	M	2760	µg/kg	5.0									
cis-1,3-Dichloropropene	N	2760	µg/kg	10									
Toluene	M	2760	µg/kg	1.0									
Trans-1,3-Dichloropropene	N	2760	µg/kg	10									
1,1,2-Trichloroethane	M	2760	µg/kg	10									

Results - Soil

Project: SW1C15840 STATION YARD, COWBIT

Client: Ground Engineering Limited			**Chemtest Job No.:**		23-00737	23-00737	23-00737	23-00737	23-00737	23-00737	23-00737	23-00737
Quotation No.: Q22-29833			**Chemtest Sample ID.:**		1572379	1572380	1572381	1572382	1572383	1572384	1572385	1572386
Order No.: SW1C15840			Client Sample Ref.:		D1	D1	D1	D2	D1	D1	B1	B1
			Sample Location:		TP1	TP2	TP3	TP3	TP5	TP6	BH1	BH2
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.15	0.05	0.1	0.2	0.05	0.25	0.0	0.0
			Bottom Depth (m):								0.3	0.3
			Date Sampled:		05-Jan-2023	05-Jan-2023	05-Jan-2023	05-Jan-2023	05-Jan-2023	05-Jan-2023	05-Jan-2023	05-Jan-2023
			Asbestos Lab:		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**								
Tetrachloroethene	M	2760	µg/kg	1.0								
1,3-Dichloropropane	U	2760	µg/kg	2.0								
Dibromochloromethane	U	2760	µg/kg	10								
1,2-Dibromoethane	M	2760	µg/kg	5.0								
Chlorobenzene	M	2760	µg/kg	1.0								
1,1,1,2-Tetrachloroethane	M	2760	µg/kg	2.0								
Ethylbenzene	M	2760	µg/kg	1.0								
m & p-Xylene	M	2760	µg/kg	1.0								
o-Xylene	M	2760	µg/kg	1.0								
Styrene	M	2760	µg/kg	1.0								
Tribromomethane	U	2760	µg/kg	1.0								
Isopropylbenzene	M	2760	µg/kg	1.0								
Bromobenzene	M	2760	µg/kg	1.0								
1,2,3-Trichloropropane	N	2760	µg/kg	50								
N-Propylbenzene	U	2760	µg/kg	1.0								
2-Chlorotoluene	M	2760	µg/kg	1.0								
1,3,5-Trimethylbenzene	M	2760	µg/kg	1.0								
4-Chlorotoluene	U	2760	µg/kg	1.0								
Tert-Butylbenzene	U	2760	µg/kg	1.0								
1,2,4-Trimethylbenzene	M	2760	µg/kg	1.0								
Sec-Butylbenzene	U	2760	µg/kg	1.0								
1,3-Dichlorobenzene	M	2760	µg/kg	1.0								
4-Isopropyltoluene	U	2760	µg/kg	1.0								
1,4-Dichlorobenzene	M	2760	µg/kg	1.0								
N-Butylbenzene	U	2760	µg/kg	1.0								
1,2-Dichlorobenzene	M	2760	µg/kg	1.0								
1,2-Dibromo-3-Chloropropane	U	2760	µg/kg	50								
1,2,4-Trichlorobenzene	M	2760	µg/kg	1.0								
Hexachlorobutadiene	N	2760	µg/kg	1.0								
1,2,3-Trichlorobenzene	U	2760	µg/kg	2.0								
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0								
Aldehydes	N	2940	mg/kg	0.10								
Amines	N	2940	mg/kg	10.00								
Ketones	N	2940	mg/kg	0.10								
N-Nitrosodimethylamine	M	2790	mg/kg	0.50								
Phenol	M	2790	mg/kg	0.50								
2-Chlorophenol	M	2790	mg/kg	0.50								

Results - Soil

Project: SW1C15840 STATION YARD, COWBIT

Client: Ground Engineering Limited				**Chemtest Job No.:**	23-00737	23-00737	23-00737	23-00737	23-00737	23-00737	23-00737	23-00737
Quotation No.: Q22-29833				**Chemtest Sample ID.:**	1572379	1572380	1572381	1572382	1572383	1572384	1572385	1572386
Order No.: SW1C15840				Client Sample Ref.:	D1	D1	D1	D2	D1	D1	B1	B1
				Sample Location:	TP1	TP2	TP3	TP3	TP5	TP6	BH1	BH2
				Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):	0.15	0.05	0.1	0.2	0.05	0.25	0.0	0.0
				Bottom Depth (m):							0.3	0.3
				Date Sampled:	05-Jan-2023	05-Jan-2023	05-Jan-2023	05-Jan-2023	05-Jan-2023	05-Jan-2023	05-Jan-2023	05-Jan-2023
				Asbestos Lab:	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**								
Bis-(2-Chloroethyl)Ether	M	2790	mg/kg	0.50								
1,3-Dichlorobenzene	M	2790	mg/kg	0.50								
1,4-Dichlorobenzene	N	2790	mg/kg	0.50								
1,2-Dichlorobenzene	M	2790	mg/kg	0.50								
2-Methylphenol	M	2790	mg/kg	0.50								
Bis(2-Chloroisopropyl)Ether	M	2790	mg/kg	0.50								
Hexachloroethane	N	2790	mg/kg	0.50								
N-Nitrosodi-n-propylamine	M	2790	mg/kg	0.50								
4-Methylphenol	M	2790	mg/kg	0.50								
Nitrobenzene	M	2790	mg/kg	0.50								
Isophorone	M	2790	mg/kg	0.50								
2-Nitrophenol	N	2790	mg/kg	0.50								
2,4-Dimethylphenol	N	2790	mg/kg	0.50								
Bis(2-Chloroethoxy)Methane	M	2790	mg/kg	0.50								
2,4-Dichlorophenol	M	2790	mg/kg	0.50								
1,2,4-Trichlorobenzene	M	2790	mg/kg	0.50								
4-Chloroaniline	N	2790	mg/kg	0.50								
Hexachlorobutadiene	M	2790	mg/kg	0.50								
4-Chloro-3-Methylphenol	M	2790	mg/kg	0.50								
2-Methylnaphthalene	M	2790	mg/kg	0.50								
4-Nitrophenol	N	2790	mg/kg	0.50								
Hexachlorocyclopentadiene	N	2790	mg/kg	0.50								
2,4,6-Trichlorophenol	M	2790	mg/kg	0.50								
2,4,5-Trichlorophenol	M	2790	mg/kg	0.50								
2-Chloronaphthalene	M	2790	mg/kg	0.50								
2-Nitroaniline	M	2790	mg/kg	0.50								
Dimethylphthalate	M	2790	mg/kg	0.50								
2,6-Dinitrotoluene	M	2790	mg/kg	0.50								
3-Nitroaniline	N	2790	mg/kg	0.50								
Dibenzofuran	M	2790	mg/kg	0.50								
4-Chlorophenylphenylether	M	2790	mg/kg	0.50								
2,4-Dinitrotoluene	M	2790	mg/kg	0.50								
Diethyl Phthalate	M	2790	mg/kg	0.50								
4-Nitroaniline	M	2790	mg/kg	0.50								
2-Methyl-4,6-Dinitrophenol	N	2790	mg/kg	0.50								
Azobenzene	M	2790	mg/kg	0.50								
4-Bromophenylphenyl Ether	M	2790	mg/kg	0.50								

Results - Soil

Project: SW1C15840 STATION YARD, COWBIT

Client: Ground Engineering Limited			**Chemtest Job No.:**		23-00737	23-00737	23-00737	23-00737	23-00737	23-00737	23-00737	23-00737
Quotation No.: Q22-29833			**Chemtest Sample ID.:**		1572379	1572380	1572381	1572382	1572383	1572384	1572385	1572386
Order No.: SW1C15840			Client Sample Ref.:		D1	D1	D1	D2	D1	D1	B1	B1
			Sample Location:		TP1	TP2	TP3	TP3	TP5	TP6	BH1	BH2
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.15	0.05	0.1	0.2	0.05	0.25	0.0	0.0
			Bottom Depth (m):								0.3	0.3
			Date Sampled:		05-Jan-2023	05-Jan-2023	05-Jan-2023	05-Jan-2023	05-Jan-2023	05-Jan-2023	05-Jan-2023	05-Jan-2023
			Asbestos Lab:		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**								
Hexachlorobenzene	M	2790	mg/kg	0.50								
Pentachlorophenol	N	2790	mg/kg	0.50								
Carbazole	M	2790	mg/kg	0.50								
Di-N-Butyl Phthalate	M	2790	mg/kg	0.50								
Butylbenzyl Phthalate	M	2790	mg/kg	0.50								
Bis(2-Ethylhexyl)Phthalate	N	2790	mg/kg	0.50								
Di-N-Octyl Phthalate	M	2790	mg/kg	0.50								
Resorcinol	M	2920	mg/kg	0.020								
Phenol	M	2920	mg/kg	0.020								
Cresols	M	2920	mg/kg	0.020								
Xylenols	M	2920	mg/kg	0.020								
1-Naphthol	N	2920	mg/kg	0.020								
Trimethylphenols	M	2920	mg/kg	0.020								
SVOC TIC	N	2790	mg/kg	N/A								
VOC TIC	N	2760	µg/kg	N/A								

Results - Soil

Project: SW1C15840 STATION YARD, COWBIT

Client: Ground Engineering Limited			**Chemtest Job No.:**		23-00737
Quotation No.: Q22-29833			**Chemtest Sample ID.:**		1572387
Order No.: SW1C15840			Client Sample Ref.:		B2
			Sample Location:		BH2
			Sample Type:		SOIL
			Top Depth (m):		0.3
			Bottom Depth (m):		0.5
			Date Sampled:		05-Jan-2023
			Asbestos Lab:		
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
pH	M	2010		4.0	8.5
Moisture	N	2030	%	0.020	17
Stones and Removed Materials	N	2030	%	0.020	
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	
Cyanide (Free)	M	2300	mg/kg	0.50	
Cyanide (Total)	M	2300	mg/kg	0.50	
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50	
Arsenic	M	2455	mg/kg	0.5	
Cadmium	M	2455	mg/kg	0.10	
Chromium	M	2455	mg/kg	0.5	
Copper	M	2455	mg/kg	0.50	
Mercury	M	2455	mg/kg	0.05	
Nickel	M	2455	mg/kg	0.50	
Lead	M	2455	mg/kg	0.50	
Selenium	M	2455	mg/kg	0.25	
Zinc	M	2455	mg/kg	0.50	
Chromium (Hexavalent)	N	2490	mg/kg	0.50	
Organic Matter	M	2625	%	0.40	
Acenaphthene	M	2790	mg/kg	0.50	< 0.50
Acenaphthene	M	2700	mg/kg	0.10	
Acenaphthylene	M	2790	mg/kg	0.50	< 0.50
Acenaphthylene	M	2700	mg/kg	0.10	
Anthracene	M	2790	mg/kg	0.50	< 0.50
Anthracene	M	2700	mg/kg	0.10	
Benzo[a]anthracene	M	2790	mg/kg	0.50	< 0.50
Benzo[a]anthracene	M	2700	mg/kg	0.10	
Benzo[a]pyrene	M	2790	mg/kg	0.50	< 0.50
Benzo[a]pyrene	M	2700	mg/kg	0.10	
Benzo[b]fluoranthene	M	2790	mg/kg	0.50	< 0.50
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	
Benzo[g,h,i]perylene	M	2790	mg/kg	0.50	< 0.50
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	
Benzo[k]fluoranthene	M	2790	mg/kg	0.50	< 0.50
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	
Chrysene	M	2790	mg/kg	0.50	< 0.50
Chrysene	M	2700	mg/kg	0.10	

Results - Soil

Project: SW1C15840 STATION YARD, COWBIT

Client: Ground Engineering Limited			**Chemtest Job No.:**		23-00737
Quotation No.: Q22-29833			**Chemtest Sample ID.:**		1572387
Order No.: SW1C15840			Client Sample Ref.:		B2
			Sample Location:		BH2
			Sample Type:		SOIL
			Top Depth (m):		0.3
			Bottom Depth (m):		0.5
			Date Sampled:		05-Jan-2023
			Asbestos Lab:		
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
Dibenz(a,h)Anthracene	M	2790	mg/kg	0.50	< 0.50
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	
Fluoranthene	M	2790	mg/kg	0.50	< 0.50
Fluoranthene	M	2700	mg/kg	0.10	
Fluorene	M	2790	mg/kg	0.50	< 0.50
Fluorene	M	2700	mg/kg	0.10	
Indeno(1,2,3-c,d)Pyrene	M	2790	mg/kg	0.50	< 0.50
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	
Naphthalene	M	2790	mg/kg	0.50	< 0.50
Naphthalene	M	2700	mg/kg	0.10	
Phenanthrene	M	2790	mg/kg	0.50	< 0.50
Phenanthrene	M	2700	mg/kg	0.10	
Pyrene	M	2790	mg/kg	0.50	< 0.50
Pyrene	M	2700	mg/kg	0.10	
Total Of 16 PAH's	M	2700	mg/kg	2.0	
Total Phenols	M	2920	mg/kg	0.10	< 0.10
ACM Type	U	2192		N/A	
Asbestos Identification	U	2192		N/A	
Soil Colour	N	2040		N/A	Brown
Other Material	N	2040		N/A	Stones and Roots
Soil Texture	N	2040		N/A	Clay
Electrical Conductivity (2:1)	N	2020	µS/cm	1.0	330
Redox Potential	N	2150	mV	N/A	0.000
Aliphatic VPH >C5-C6	M	2780	mg/kg	0.05	< 0.05
Aliphatic VPH >C6-C7	M	2780	mg/kg	0.05	< 0.05
Aliphatic VPH >C7-C8	M	2780	mg/kg	0.05	< 0.05
Aliphatic VPH >C8-C10	M	2780	mg/kg	0.05	0.17
Total Aliphatic VPH >C5-C10	M	2780	mg/kg	0.25	< 0.25
Aliphatic EPH >C10-C12	M	2690	mg/kg	2.00	< 2.0
Aliphatic EPH >C12-C16	M	2690	mg/kg	1.00	< 1.0
Aliphatic EPH >C16-C21	M	2690	mg/kg	2.00	< 2.0
Aliphatic EPH >C21-C35	M	2690	mg/kg	3.00	< 3.0
Aliphatic EPH >C35-C40	N	2690	mg/kg	1.00	< 1.0
Total Aliphatic EPH >C10-C35	M	2690	mg/kg	5.00	< 5.0
Aromatic VPH >C5-C7	M	2780	mg/kg	0.05	< 0.05

Results - Soil

Project: SW1C15840 STATION YARD, COWBIT

Client: Ground Engineering Limited			**Chemtest Job No.:**		23-00737
Quotation No.: Q22-29833			**Chemtest Sample ID.:**		1572387
Order No.: SW1C15840			Client Sample Ref.:		B2
			Sample Location:		BH2
			Sample Type:		SOIL
			Top Depth (m):		0.3
			Bottom Depth (m):		0.5
			Date Sampled:		05-Jan-2023
			Asbestos Lab:		
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
Aromatic VPH >C7-C8	M	2780	mg/kg	0.05	< 0.05
Aromatic VPH >C8-C10	M	2780	mg/kg	0.05	< 0.05
Total Aromatic VPH >C5-C10	M	2780	mg/kg	0.25	< 0.25
Aromatic EPH >C10-C12	M	2690	mg/kg	1.00	< 1.0
Aromatic EPH >C12-C16	M	2690	mg/kg	1.00	< 1.0
Aromatic EPH >C16-C21	N	2690	mg/kg	2.00	2.6
Aromatic EPH >C21-C35	M	2690	mg/kg	2.00	< 2.0
Aromatic EPH >C35-C40	N	2690	mg/kg	1.00	< 1.0
Total Aromatic EPH >C10-C35	M	2690	mg/kg	5.00	< 5.0
Total VPH >C5-C10	M	2780	mg/kg	0.50	< 0.50
Total EPH >C10-C35	M	2690	mg/kg	10.00	< 10
Total TPH >C6-C40	M	2670	mg/kg	10	
Dichlorodifluoromethane	U	2760	µg/kg	1.0	< 1.0
Chloromethane	M	2760	µg/kg	1.0	< 1.0
Vinyl Chloride	M	2760	µg/kg	1.0	< 1.0
Bromomethane	M	2760	µg/kg	20	< 20
Chloroethane	U	2760	µg/kg	2.0	< 2.0
Trichlorofluoromethane	M	2760	µg/kg	1.0	< 1.0
1,1-Dichloroethene	M	2760	µg/kg	1.0	< 1.0
Trans 1,2-Dichloroethene	M	2760	µg/kg	1.0	< 1.0
1,1-Dichloroethane	M	2760	µg/kg	1.0	< 1.0
cis 1,2-Dichloroethene	M	2760	µg/kg	1.0	< 1.0
Bromochloromethane	U	2760	µg/kg	5.0	< 5.0
Trichloromethane	M	2760	µg/kg	1.0	< 1.0
1,1,1-Trichloroethane	M	2760	µg/kg	1.0	< 1.0
Tetrachloromethane	M	2760	µg/kg	1.0	< 1.0
1,1-Dichloropropene	U	2760	µg/kg	1.0	< 1.0
Benzene	M	2760	µg/kg	1.0	< 1.0
1,2-Dichloroethane	M	2760	µg/kg	2.0	< 2.0
Trichloroethene	N	2760	µg/kg	1.0	< 1.0
1,2-Dichloropropane	M	2760	µg/kg	1.0	< 1.0
Dibromomethane	M	2760	µg/kg	1.0	< 1.0
Bromodichloromethane	M	2760	µg/kg	5.0	< 5.0
cis-1,3-Dichloropropene	N	2760	µg/kg	10	< 10
Toluene	M	2760	µg/kg	1.0	< 1.0
Trans-1,3-Dichloropropene	N	2760	µg/kg	10	< 10
1,1,2-Trichloroethane	M	2760	µg/kg	10	< 10

Results - Soil

Project: SW1C15840 STATION YARD, COWBIT

Client: Ground Engineering Limited			**Chemtest Job No.:**		23-00737
Quotation No.: Q22-29833			**Chemtest Sample ID.:**		1572387
Order No.: SW1C15840			Client Sample Ref.:		B2
			Sample Location:		BH2
			Sample Type:		SOIL
			Top Depth (m):		0.3
			Bottom Depth (m):		0.5
			Date Sampled:		05-Jan-2023
			Asbestos Lab:		
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
Tetrachloroethene	M	2760	µg/kg	1.0	< 1.0
1,3-Dichloropropane	U	2760	µg/kg	2.0	< 2.0
Dibromochloromethane	U	2760	µg/kg	10	< 10
1,2-Dibromoethane	M	2760	µg/kg	5.0	< 5.0
Chlorobenzene	M	2760	µg/kg	1.0	< 1.0
1,1,1,2-Tetrachloroethane	M	2760	µg/kg	2.0	< 2.0
Ethylbenzene	M	2760	µg/kg	1.0	< 1.0
m & p-Xylene	M	2760	µg/kg	1.0	< 1.0
o-Xylene	M	2760	µg/kg	1.0	< 1.0
Styrene	M	2760	µg/kg	1.0	< 1.0
Tribromomethane	U	2760	µg/kg	1.0	< 1.0
Isopropylbenzene	M	2760	µg/kg	1.0	< 1.0
Bromobenzene	M	2760	µg/kg	1.0	< 1.0
1,2,3-Trichloropropane	N	2760	µg/kg	50	< 50
N-Propylbenzene	U	2760	µg/kg	1.0	< 1.0
2-Chlorotoluene	M	2760	µg/kg	1.0	< 1.0
1,3,5-Trimethylbenzene	M	2760	µg/kg	1.0	< 1.0
4-Chlorotoluene	U	2760	µg/kg	1.0	< 1.0
Tert-Butylbenzene	U	2760	µg/kg	1.0	< 1.0
1,2,4-Trimethylbenzene	M	2760	µg/kg	1.0	< 1.0
Sec-Butylbenzene	U	2760	µg/kg	1.0	< 1.0
1,3-Dichlorobenzene	M	2760	µg/kg	1.0	< 1.0
4-Isopropyltoluene	U	2760	µg/kg	1.0	< 1.0
1,4-Dichlorobenzene	M	2760	µg/kg	1.0	< 1.0
N-Butylbenzene	U	2760	µg/kg	1.0	< 1.0
1,2-Dichlorobenzene	M	2760	µg/kg	1.0	< 1.0
1,2-Dibromo-3-Chloropropane	U	2760	µg/kg	50	< 50
1,2,4-Trichlorobenzene	M	2760	µg/kg	1.0	< 1.0
Hexachlorobutadiene	N	2760	µg/kg	1.0	< 1.0
1,2,3-Trichlorobenzene	U	2760	µg/kg	2.0	< 2.0
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	< 1.0
Aldehydes	N	2940	mg/kg	0.10	< 0.10
Amines	N	2940	mg/kg	10.00	< 10
Ketones	N	2940	mg/kg	0.10	< 0.10
N-Nitrosodimethylamine	M	2790	mg/kg	0.50	< 0.50
Phenol	M	2790	mg/kg	0.50	< 0.50
2-Chlorophenol	M	2790	mg/kg	0.50	< 0.50

Results - Soil

Project: SW1C15840 STATION YARD, COWBIT

Client: Ground Engineering Limited			**Chemtest Job No.:**		23-00737
Quotation No.: Q22-29833			**Chemtest Sample ID.:**		1572387
Order No.: SW1C15840			Client Sample Ref.:		B2
			Sample Location:		BH2
			Sample Type:		SOIL
			Top Depth (m):		0.3
			Bottom Depth (m):		0.5
			Date Sampled:		05-Jan-2023
			Asbestos Lab:		
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
Bis-(2-Chloroethyl)Ether	M	2790	mg/kg	0.50	< 0.50
1,3-Dichlorobenzene	M	2790	mg/kg	0.50	< 0.50
1,4-Dichlorobenzene	N	2790	mg/kg	0.50	< 0.50
1,2-Dichlorobenzene	M	2790	mg/kg	0.50	< 0.50
2-Methylphenol	M	2790	mg/kg	0.50	< 0.50
Bis(2-Chloroisopropyl)Ether	M	2790	mg/kg	0.50	< 0.50
Hexachloroethane	N	2790	mg/kg	0.50	< 0.50
N-Nitrosodi-n-propylamine	M	2790	mg/kg	0.50	< 0.50
4-Methylphenol	M	2790	mg/kg	0.50	< 0.50
Nitrobenzene	M	2790	mg/kg	0.50	< 0.50
Isophorone	M	2790	mg/kg	0.50	< 0.50
2-Nitrophenol	N	2790	mg/kg	0.50	< 0.50
2,4-Dimethylphenol	N	2790	mg/kg	0.50	< 0.50
Bis(2-Chloroethoxy)Methane	M	2790	mg/kg	0.50	< 0.50
2,4-Dichlorophenol	M	2790	mg/kg	0.50	< 0.50
1,2,4-Trichlorobenzene	M	2790	mg/kg	0.50	< 0.50
4-Chloroaniline	N	2790	mg/kg	0.50	< 0.50
Hexachlorobutadiene	M	2790	mg/kg	0.50	< 0.50
4-Chloro-3-Methylphenol	M	2790	mg/kg	0.50	< 0.50
2-Methylnaphthalene	M	2790	mg/kg	0.50	< 0.50
4-Nitrophenol	N	2790	mg/kg	0.50	< 0.50
Hexachlorocyclopentadiene	N	2790	mg/kg	0.50	< 0.50
2,4,6-Trichlorophenol	M	2790	mg/kg	0.50	< 0.50
2,4,5-Trichlorophenol	M	2790	mg/kg	0.50	< 0.50
2-Chloronaphthalene	M	2790	mg/kg	0.50	< 0.50
2-Nitroaniline	M	2790	mg/kg	0.50	< 0.50
Dimethylphthalate	M	2790	mg/kg	0.50	< 0.50
2,6-Dinitrotoluene	M	2790	mg/kg	0.50	< 0.50
3-Nitroaniline	N	2790	mg/kg	0.50	< 0.50
Dibenzofuran	M	2790	mg/kg	0.50	< 0.50
4-Chlorophenylphenylether	M	2790	mg/kg	0.50	< 0.50
2,4-Dinitrotoluene	M	2790	mg/kg	0.50	< 0.50
Diethyl Phthalate	M	2790	mg/kg	0.50	< 0.50
4-Nitroaniline	M	2790	mg/kg	0.50	< 0.50
2-Methyl-4,6-Dinitrophenol	N	2790	mg/kg	0.50	< 0.50
Azobenzene	M	2790	mg/kg	0.50	< 0.50
4-Bromophenylphenyl Ether	M	2790	mg/kg	0.50	< 0.50

Results - Soil

Project: SW1C15840 STATION YARD, COWBIT

Client: Ground Engineering Limited			**Chemtest Job No.:**		23-00737
Quotation No.: Q22-29833			**Chemtest Sample ID.:**		1572387
Order No.: SW1C15840			Client Sample Ref.:		B2
			Sample Location:		BH2
			Sample Type:		SOIL
			Top Depth (m):		0.3
			Bottom Depth (m):		0.5
			Date Sampled:		05-Jan-2023
			Asbestos Lab:		
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
Hexachlorobenzene	M	2790	mg/kg	0.50	< 0.50
Pentachlorophenol	N	2790	mg/kg	0.50	< 0.50
Carbazole	M	2790	mg/kg	0.50	< 0.50
Di-N-Butyl Phthalate	M	2790	mg/kg	0.50	< 0.50
Butylbenzyl Phthalate	M	2790	mg/kg	0.50	< 0.50
Bis(2-Ethylhexyl)Phthalate	N	2790	mg/kg	0.50	< 0.50
Di-N-Octyl Phthalate	M	2790	mg/kg	0.50	< 0.50
Resorcinol	M	2920	mg/kg	0.020	< 0.020
Phenol	M	2920	mg/kg	0.020	< 0.020
Cresols	M	2920	mg/kg	0.020	< 0.020
Xylenols	M	2920	mg/kg	0.020	< 0.020
1-Naphthol	N	2920	mg/kg	0.020	< 0.020
Trimethylphenols	M	2920	mg/kg	0.020	< 0.020
SVOC TIC	N	2790	mg/kg	N/A	None Detected
VOC TIC	N	2760	µg/kg	N/A	None Detected

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2020	Electrical Conductivity	Electrical conductivity (EC) of aqueous extract or calcium sulphate solution for topsoil	Measurement of the electrical resistance of a 2:1 water/soil extract.
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2150	Redox Potential	Redox Potential	Meter
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine.
2455	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2690	EPH A/A Split	Aliphatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40 Aromatics: >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35–C40	Acetone/Heptane extraction / GCxGC FID detection
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2780	VPH A/A Split	Aliphatics: >C5–C6, >C6–C7,>C7–C8,>C8-C10 Aromatics: >C5–C7,>C7-C8,>C8–C10	Water extraction / Headspace GCxGC FID detection
2790	Semi-Volatile Organic Compounds (SVOCs) in Soils by GC-MS	Semi-volatile organic compounds(cf. USEPA Method 8270)	Acetone/Hexane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Test Methods

SOP	Title	Parameters included	Method summary
2940	Glycols, Aldehydes, Amines, Ethers and Ketones	Glycols, Aldehydes, Amines, Ethers and Ketones	GCMS detection

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

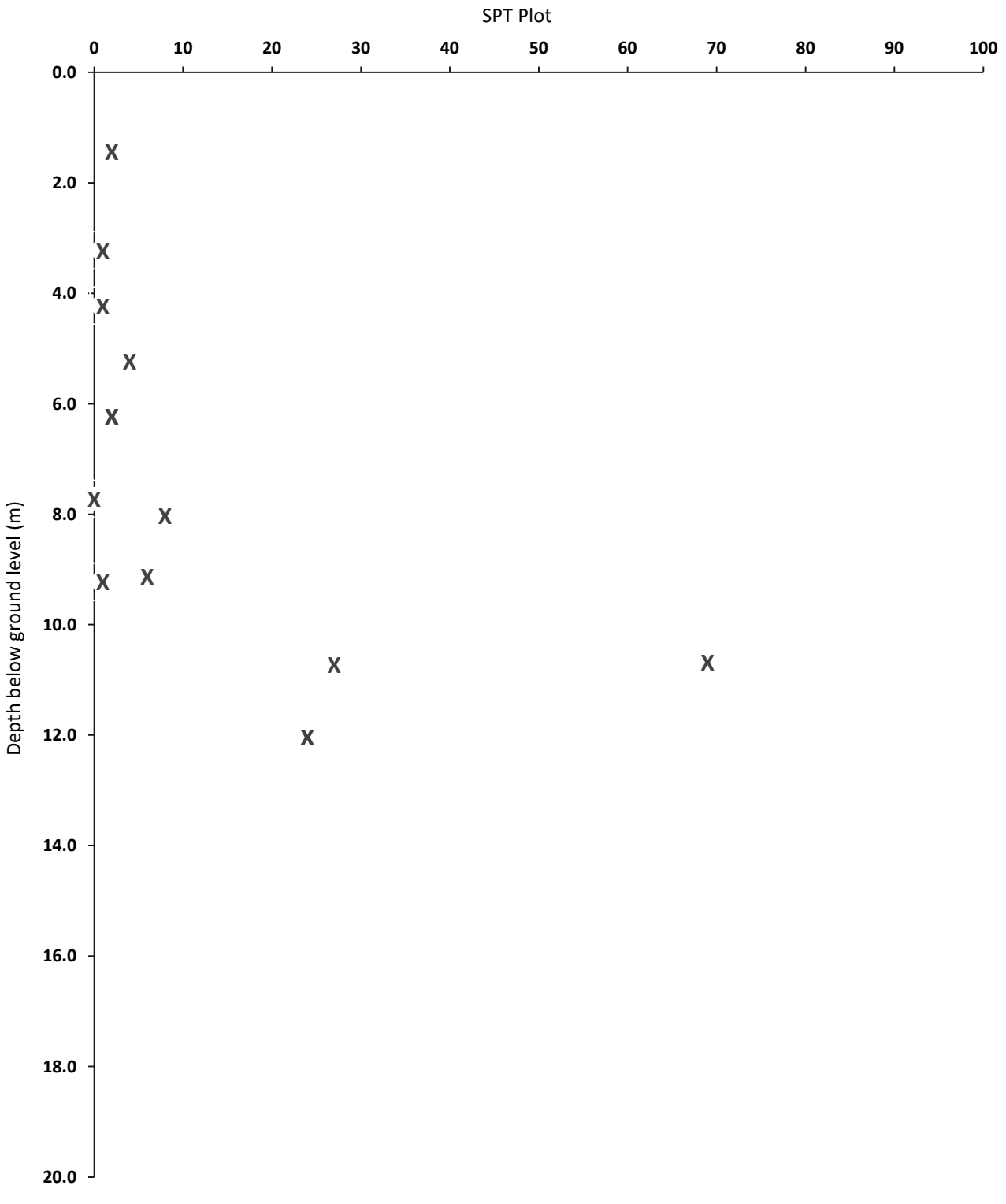
Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

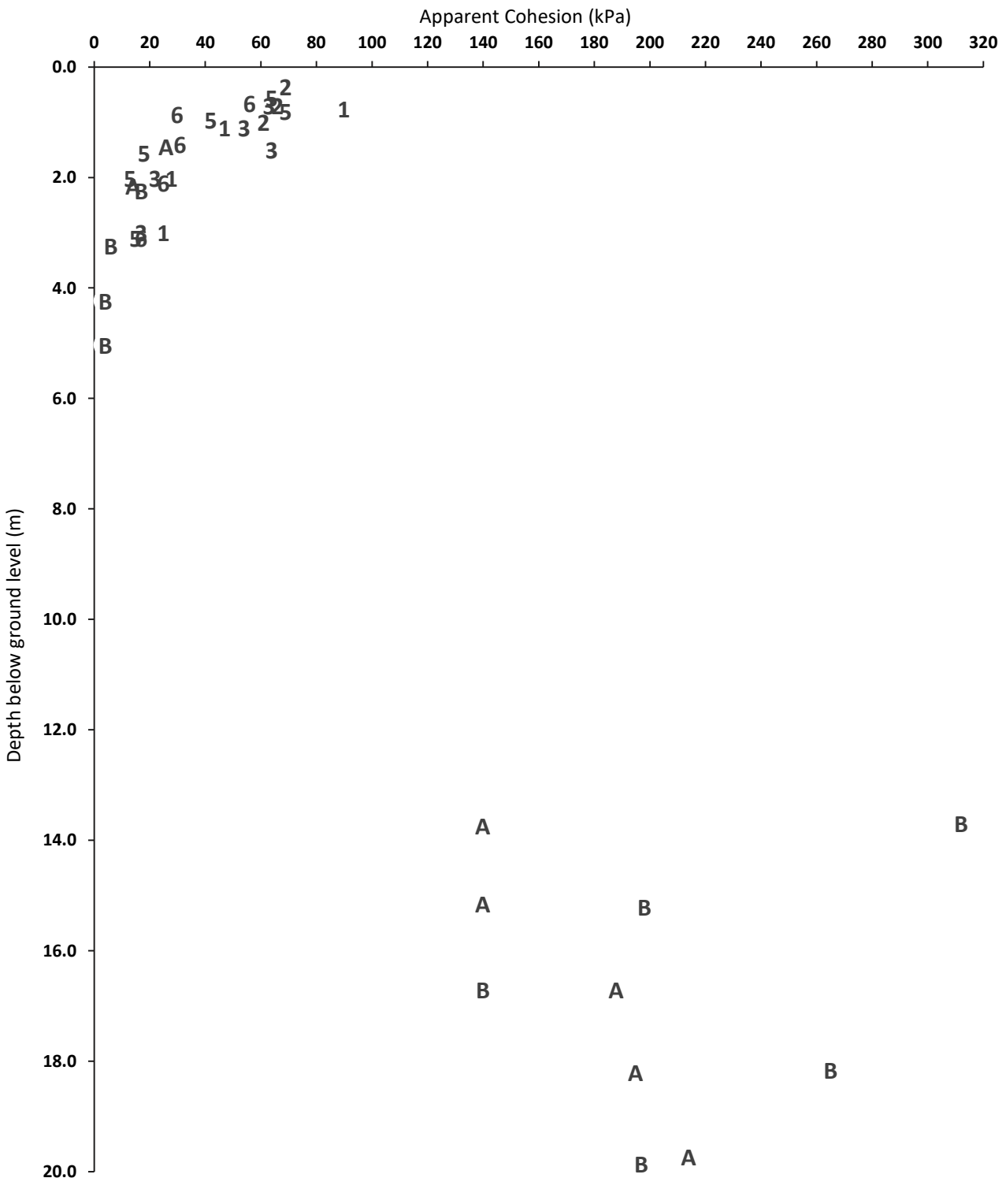


Key: BH1 & BH2 = X

SPT Plot v Depth below ground level (m)

SITE	**Station Yard, Mill Drove South, Cowbit, Spalding**
CLIENT	**Seagate Homes**

GROUND ENGINEERING LIMITED Newark Road, Peterborough	Project No. C15840 Figure 1



Key: BH1-A, BH2-B, TP1-1, TP2-2, TP3-3, TP5-5 & TP6-6

Apparent Cohesion (kPa) v Depth below ground level (m)

SITE	**Station Yard, Mill Drove South, Cowbit, Spalding**
CLIENT	**Seagate Homes**

GROUND ENGINEERING LIMITED
Newark Road, Peterborough

Project No. C15840
Figure 2

KEY TO LEGENDS



MADE GROUND



TIDAL FLAT DEPOSIT



TIDAL FLAT DEPOSIT - ORGANIC



MARINE SAND



OLD BEACH DEPOSIT



TILL



OXFORD CLAY

▽ Groundwater Encountered

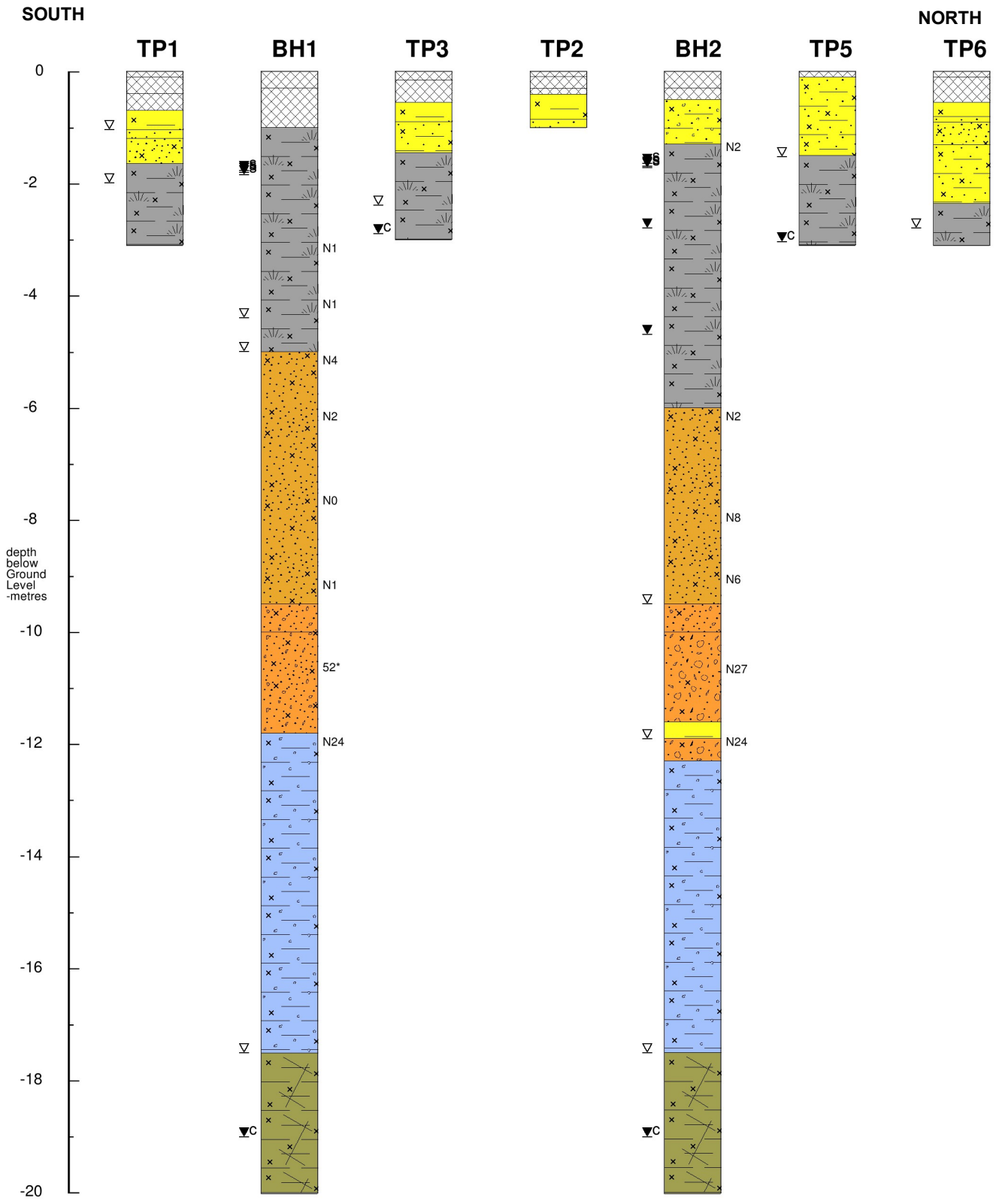
▼ Groundwater Rise

▼c Level on Completion

c ▼ w Level Casing Withdrawn

▼ s Standpipe Level

Project : Station Yard, Mill Drove South, Cowbit, Spalding **Client : Seagate Homes**	**GROUND ENGINEERING LIMITED** Tel : 01733 566566	**Soil Profile** **Fig No. 3**	**Project No** **C15840** **Vertical Scale 1:100**



Project : Station Yard, Mill Drove South, Cowbit, Spalding **Client : Seagate Homes**	**GROUND ENGINEERING LIMITED** Tel : 01733 566566	**Soil Profile** **Fig No. 3**	**Project No** **C15840** **Vertical Scale 1:100**

APPENDIX 1

CLASSIFICATION OF AGGRESSIVE CHEMICAL ENVIRONMENT FOR BURIED CONCRETE

TABLE C1 – AGGRESSIVE CHEMICAL ENVIRONMENT FOR CONCRETE (ACEC) CLASSIFICATION FOR NATURAL GROUND LOCATIONS[a]

Table C1 Aggressive Chemical Environment for Concrete (ACEC) classification for natural ground locations[a]

Sulfate				Groundwater		ACEC
Design Sulfate Class for location	2:1 water/soil extract[b]	Groundwater	Total potential sulfate[c]	Static water	Mobile water	Class for location
1	2 (SO_4 mg/l)	3 (SO_4 mg/l)	4 (SO_4 %)	5 (pH)	6 (pH)	7
DS-1	< 500	< 400	< 0.24	≥ 2.5		AC-1s
					> 5.5[d]	AC-1[d]
					2.5–5.5	AC-2z
DS-2	500–1500	400–1400	0.24–0.6	> 3.5		AC-1s
					> 5.5	AC-2
				2.5–3.5		AC-2s
					2.5–5.5	AC-3z
DS-3	1600–3000	1500–3000	0.7–1.2	> 3.5		AC-2s
					> 5.5	AC-3
				2.5–3.5		AC-3s
					2.5–5.5	AC-4
DS-4	3100–6000	3100–6000	1.3–2.4	> 3.5		AC-3s
					> 5.5	AC-4
				2.5–3.5		AC-4s
					2.5–5.5	AC-5
DS-5	> 6000	> 6000	> 2.4	> 3.5		AC-4s
				2.5–3.5	≥ 2.5	AC-5

Notes

a Applies to locations on sites that comprise either undisturbed ground that is in its natural state (ie is not brownfield – Table C2) or clean fill derived from such ground.

b The limits of Design Sulfate Classes based on 2:1 water/soil extracts have been lowered relative to previous Digests (Box C7).

c Applies only to locations where concrete will be exposed to sulfate ions (SO_4) which may result from the oxidation of sulfides (eg pyrite) following ground disturbance (Appendix A1 and Box C8).

d For flowing water that is potentially aggressive to concrete owing to high purity or an aggressive carbon dioxide level greater than 15 mg/l (Section C2.2.3), increase the ACEC Class to AC-2z.

Explanation of suffix symbols to ACEC Class

- Suffix 's' indicates that the water has been classified as static.
- Concrete placed in ACEC Classes that include the suffix 'z' primarily have to resist acid conditions and may be made with any of the cements or combinations listed in Table D2 on page 42.

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