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Phase 2 Intrusive Site Investigation Report

LOCATION	Proposed Residential Development, Land at Main Road, Gainford, Darlington, DL2 3BQ
ISSUE DATE	7th September 2018
FOR	Kebbell Homes
CLIENT REF.	
OUR REF.	G18214b

Prepared by

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1. Introduction

In accordance with your instruction, Geoinvestigate Ltd. has carried out a Phase 2 investigation on a largely vacant plot of land to the south of Main Road, Gainford. The boundary of the study area is shown on the site plan presented in Appendix 1 of this report and access is from Main Road to the North.

The site previously included numerous buildings first used as an orphanage, subsequently as a school and finally as a nursing home with various additions and demolition works throughout its history. A Phase 1 Desk Study of the site, has previously been compiled by Geoinvestigate Ltd. (Report ref. G18214, issued June 2018). The findings of the Phase 1 Desk Study have formed the basis for the design of the current investigation.

The proposed development at the site currently comprises a residential housing development; an outline development plan is shown on the site plan in Appendix 1 will mostly comprise normal 2-3 storey housing with what remains of the original building (in the north of the site) being converted into apartments.

Arable land with some residential properties lies to the east and west of the site boundaries with Main Road to the north and apparently previously undeveloped land to the south (though historical mapping would suggest that this has been used as gardens/grounds for the school/orphanage in the past). Further to the south a former sewage works site sits adjacent to the River Tees.

The purpose of the Phase 2 investigation was to establish the true nature of the ground conditions at the site for foundation design and to assess the risks highlighted in the Phase 1 desk study with regard to geotechnical hazards and the potential for hazardous gas and contamination to occur at the site.

1.1 Design of Investigation

The study area has had significant development/demolition works in the past but relatively few potentially contaminative activities therein; primarily concerning a tank and an electricity substation which are noted on the 1973 and 1985 maps, and the possible use of asbestos in construction. The substation, or at least the structure containing it, appears to remain present at the northeast corner of the site. Currently two raised areas are present at the site; these are assumed to largely comprise demolition rubble from the wings of the former school building(s) which extended south into the site and are now absent. An area of concrete hardstanding is also present in the south of the site which partially overlies areas formerly covered by school buildings. A second remaining school building (in relatively poor state of repair) remains present just to the north of this concrete area. Much of the west of the site appears to have remained undeveloped.

Anecdotal evidence has been provided by an occupant of the neighbouring residential property to the west about a former boiler house allegedly located in the north of the site, between BH3 and BH4 of this investigation. The large amount of raised ground/fill in this area has prevented full investigation of this possibility however.

Superficial and bedrock geology is mapped respectively as River Terrace Deposits (gravel, sand and silt) with the Stainmore Formation (mudstone, siltstone and sandstone) commencing at depth. Nearby BGS borehole records are concurrent with this.

Given the findings of the desk study, and the anticipated ground conditions and potential sources of contamination and/or made ground, this investigation was designed to establish both the nature of the ground conditions across the site generally as well as specifically in the areas where made ground or contamination might be more likely to be present.

The aforementioned areas of raised ground (outlined on the site plan presented in Appendix 1) were suspected to comprise made or built-up ground probably sourced from demolition works.

The borehole locations were chosen to give maximum coverage of the site as a whole for both geo-environmental and geotechnical considerations combined, rather than to target either proposed building locations (for geotechnical reasons) or areas intended to comprise soft landscaping (to address potential contamination issues) separately. Areas of the site where possible made ground, relic foundations or contamination might have been encountered were however targeted specifically such as at BH2, BH4, and BH5 (where raised ground was present) with location specific soil analysis also undertaken such as at BH19 close to a substation, and BH5-BH6 close to a former tank location.

California bearing ratio (CBR) testing was undertaken using a handheld Mexeprobe in some locations to aid in the design of roads and parking areas.

Water infiltration testing has also been undertaken in two shallower boreholes to establish the suitability of the on-site geology for soakaway installation.

Installation of monitoring wells and subsequent ground gas monitoring has also been undertaken to establish the ground gas risk at the site (see section 6 later).

2. Scope of Phase 2 Investigation

2.1 Scope of Works

Given the above the following investigation was carried out to assess the potential risks at the site:

- The sinking of twenty two (22) windowless sampling boreholes (BH1 to BH22) to depths of between 0.80m and 4.00m (generally to 4.00m or refusal) with associated soil sampling and supervision of the works by a suitably qualified geo-environmental engineer. The boreholes were sunk using a Dando Terrier 2002 mini drilling rig.

- The excavation of six (6) hand-dug trial pits (TPA to TPF) to depths of up to 0.75m to recover additional samples for contamination analysis and to carry out CBR testing using a handheld Mexeprobe.

- Geotechnical Testing comprising six (6) Atterberg Limits and one hundred and twenty (120) moisture determinations to provide information with regard to soil plasticity on the site.

- Two water infiltration tests in shallower boreholes (BH21 and BH22) to establish the permeability of natural subsoils at the site and determine parameters for soakaway design for the proposed development.

- The installation of three (3) gas monitoring wells in boreholes BH4, BH10 and BH14 with up to six (6) gas monitoring visits over a period of up to three (3) months (if appropriate), including readings below 1000mb and where possible following a sharp drop in atmospheric pressure.

- Contamination analyses of ten (10) samples of topsoil, made ground and underlying natural soils recovered at depths up to 2.50m to confirm that metals, asbestos, polycyclic aromatic hydrocarbons (PAHs), and petroleum hydrocarbons (including BTEX) are absent or within acceptable limits. Analysis for polychlorinated biphenyls (PCBs) was also undertaken in the relevant part of the site close to the substation. (Chemical analyses based on findings of the Phase 1 Desk Study Report, additional initial site assessment by Geoinvestigate, and on the attending engineer's assessment of encountered soils). Leachate from three (3) samples was also tested to check the mobility of the contaminants.

- Provision of a factual and interpretative report including; site plan, borehole logs, and geotechnical and contamination analysis results, together with advice on suitable foundation types and, if required, remediation and validation.

The borehole and trial pit positions are shown on the plan provided in Appendix 1.

The excavations were sampled and logged at site by a geo-environmental engineer and the ground conditions encountered are described on the borehole logs also provided in Appendix 1.

Moisture and Atterberg Limit test results are provided in Appendix 2 (Table 3) along with moisture profiles of the boreholes. Results of water infiltration testing are also provided in Appendix 2.

The results of the contamination testing are included in Appendix 3.

2.2 Sampling Rationale

As discussed in section 1.1, specific areas of the site were deliberately targeted where suspected made (raised) ground was present (BH2, BH4 & BH5) but more generally, as a large portion of the site had previously been overlain by various buildings, these locations were worked in to a semi-regular pattern of boreholes across the site as a whole where made ground or relic foundations may have been encountered (save for the west of the site where historical mapping suggested this would be less likely).

Samples chosen for contamination were partly targeted samples of material deemed the most likely to contain contamination, or where contamination might be expected to be more likely/higher risk (such as close to the former tank/substation areas) together with more general testing carried out on soils from across the site deemed by the attending engineer to be adequately representative of all soil types present at the site.

3. Phase 2 Investigation Findings

3.1 Encountered Ground Conditions

⟶ 3.1.1 Windowless Sampling Boreholes

⟶ 3.1.1.1 BH1-BH5 & BH16-BH20 (North of site)

In the north of the study area the final remaining part of the original school complex remains present with what would be called the "wings" of the former school having been removed (which extended south into the site on both the east and west sides of the remaining structure). The majority of the former buildings were confined to the north of the site though two annexes are shown on part of the historical map record to have extended south into the area which is now covered with concrete hardstanding.

Areas of apparently artificially raised ground levels were targeted at boreholes BH2, BH4 and, BH5 to inspect the makeup and condition of what was suspected to be demolition rubble associated with the removal of the former school buildings. The remainder of the boreholes in this part of the site were sunk to inspect ground conditions more generally throughout the site area.

Boreholes BH3 and BH18 encountered no made ground with just turf underlain by topsoil at the site surface followed by natural subsoils to the full depth of the boreholes.

Made ground was encountered to depths of 0.85m and 0.75m at boreholes BH1 and BH17, and to depths of between 0.80m and 3.80m in the remaining six boreholes where ground was inferred to have been raised with probable demolition rubble.

Turf underlain by topsoil was present at the surface at BH1-BH5 and BH18 to depths of between 0.10m and 0.40m. The topsoil generally comprised clayey gravelly sand with gravel constituents of just sandstone and brick and would not be expected to be comprise any significant evidence/risk of contamination at the site.

Made ground, where present, generally comprised sandstone and brick gravel with pot and concrete also noted in places. Asphalt and dolomitic limestone gravel were also noted at BH1 exclusively.

The western raised area (BH2, BH4 and BH5) was greater in height than the similar feature in the east of the site (which essentially just comprises a bund to prevent unwanted trespassing). Boreholes BH4 and BH5 encountered a brown clayey horizon of fill at the base of the made ground, inferred at BH6 to possibly comprise a former topsoil layer. The depth of the made ground at BH2, BH4 and BH5 is approximately consistent with the adjacent non-raised ground levels with the mound being constructed on a slope (sloping down to the south) and being greater in height at the south. The alleged former boiler house lay within the footprint of this western raised area between BH3 and BH4.

Wood fragments were recorded in the fill at BH20 which extended to at least 2.40m below ground level (BGL) with the exact depth of made ground unable to be confirmed at this location. This was greater than the general depth of made ground in this part of the site and may have comprised a former basement feature infilled with demolition rubble. Note also that BH16 could not penetrate beyond 0.80m BGL despite three attempts being made suggesting either very compact and/or large pieces of rubble of perhaps a relic foundation or similar feature may be present.

Natural subsoils generally comprised medium dense and dense sandy gravel and cobbles of sandstone with loose to medium dense and very dense horizons also recorded. Generally, these natural granular strata were competent in nature with SPT (standard penetration test) N values of between N=10 and N=105. Some clay-containing horizons (such as at BH1 and BH2) were noted in the natural strata though these were not typical of ground conditions throughout the site.

No roots were encountered in any of the boreholes.

All of the boreholes remained dry on completion.

Seven of the ten boreholes collapsed on completion below depths of 1.30m (BH3), 1.60m (BH4), 2.60m (BH5), 1.80m (BH17 & BH18), and 1.40m (BH19 & BH20)

3.1.1 Windowless Sampling Boreholes

⟶ 3.1.1.2 BH6-BH15 (South of Site)

Boreholes BH6 to BH10 were sunk in the southwest of the study area while boreholes BH11 to BH15 were sunk in the southeast.

Much of the southeast of the site is covered with concrete hardstanding which was encountered at the surface at boreholes BH11, BH12 and BH15 to depths of between 0.08m and 0.10m. The remainder of the boreholes in the south of the site encountered turf underlain by topsoil (comparable to that in the north of the site) to depths of between 0.10m and 0.30m save for BH13 which encountered natural subsoils from ground level.

Made ground was encountered where the concrete surface was present to depths of between 0.25m and 0.75m. At BH15 this comprised a dolomitic limestone gravel sub-base with some brick fragments while at BH11 and BH12 the made ground comprised black, sandy, ash-containing gravel underlain at BH12 by brick and sandstone gravel more typical of the rest of the site (though noted to contain occasional metal fragments and dark staining).

Made ground was also encountered at BH6 (to 1.30m BGL) and BH9 (to 0.60m BGL). This comprised the sandstone and brick gravel fill encountered generally throughout the site but at BH6 was also noted to contain horizons of darker material variably containing ash, wood and/or slag fragments. It is speculated that BH6 was located within an infilled drainage ditch/excavation or similar feature due to the nature and depth of the fill material and the slightly weaker subsoils (potentially due to drain failure); additionally, manholes are present in the vicinity.

No made ground was encountered at BH7, BH8, BH10, BH13 and BH14.

Natural soils were generally similar to the sandy gravels described in the preceding section of this report returning SPT N values of between N=11 and refusal values of N>50. An exception to this being at BH6 where a value of N=0 was returned at 1.00m (partly testing made ground) and a value of N=4 was returned at 2.00m (soils becoming medium dense below 2.60m).

Some clay-containing horizons were again noted though this time with a greater clay content than in the north of the site, such as borderline clayey gravelly sand / sandy gravelly clay strata. These soils were

generally the shallower (to depths of between 0.90m and 2.70m) strata and were underlain by the non-cohesive sandy gravel soils. These strata appear to be present in the southeast of the site (at BH10-BH15).

No roots were encountered in any of the boreholes.

All of the boreholes remained dry on completion.

One of the ten boreholes collapsed on completion below a depth of 3.00m (BH14).

3.1.1 Windowless Sampling Boreholes

⟹ 3.1.1.2 BH21-BH22 (Water Infiltration Testing)

Boreholes BH21 and BH22 were sunk to only 1.10m simply to carry out water infiltration testing.

BH21 encountered turf underlain by topsoil to 0.30m underlain by made ground perhaps comparable to that at BH11 which contained occasional black colouration and slag gravel (though with no metal noted). BH22 encountered concrete underlain by brown sand fill.

Natural soils comprised sandy gravel / gravelly sand at BH21 and gravelly sand at BH22 noted to be clayey to 0.90m BGL.

3.1.2 Hand Excavated Trial Pits (TPA-TPF)

Trial pits TPA to TPF were sunk to further inspect the makeup and condition of soils at the site, to recover additional samples for contamination analysis, and to carry out CBR testing using a handheld Mexeprobe at TPB, TPC and TPF which were located within proposed roadways.

The trial pits encountered generally similar topsoil, made ground and natural subsoils to those encountered by the boreholes. Notably, ash was noted in the shallow made ground horizon at the surface at TPE and a sample of this material was deliberately chosen for contamination analysis accordingly.

3.1.3 Review of ground conditions encountered.

<u>Made ground</u>

Generally, the made ground at the site showed no obvious evidence of potential contamination or contaminative materials and mostly comprised sandstone and brick gravel with occasional concrete, pot dolomitic limestone etc. However, the fill material in several locations was noted to contain ash and occasionally slag, wood, asphalt, metal and plastic fragments; soils containing ash and/or slag were deemed to be the most likely materials to contain elevated levels of potential contaminants and representative samples were duly recovered and submitted for laboratory analysis (specifically BH6 and TPE). Other more general made ground, inferred to mostly comprise demolition rubble, was assumed to have some risk of non-visible asbestos contamination as well as other more general potential contaminants but this risk was thought to be lower due to a lack of visual/olfactory evidence of potential contamination.

It has been assumed that the raised areas of the site will subsequently be removed from site prior to its future residential development to create a relatively level development site. As such, the remainder of this report will assume that this mass of made ground will be removed prior to development and the

future ground level is hitherto assumed to be that of the surrounding ground levels. Where recommended foundation depths are stated for this area later in this document, these will generally refer to depths below the ground levels following removal of these mounds.

Natural Underlying Strata

Competent generally sandy gravel soils have been encountered across the site at relatively shallow depth or directly below the made ground (where present) with the exception of BH6 where slightly less competent ground exists to 2.60m BGL. In the southeast of the site (BH10-BH15) these deposits are noted to have a clay content at shallow depth (generally up to ca. 1m-2m).

3.2 Soil Plasticity and Vegetation Influence

Samples of more clayey strata at the site from BH1, BH7 and BH11-BH15 generally classify as Silt of Intermediate (MI) Plasticity according to BS 5930. Two of the seven tests returned classifications of Silt of Intermediate (MI) Plasticity, two of the tests returned classifications of Silt of High (MH) or borderline Intermediate/High (MI/MH) Plasticity, and 2 of the tests returning a classification of Clay of Intermediate (CI) Plasticity. One test returned a classification of essentially non-plastic material, which should be inferred for all non-cohesive soils at the site (the vast majority of soils encountered by the investigation). With plasticity indices of between 10.4% and 27.9% (though generally between 10.1% and 23.5%) returned by the testing, these soils equate to NHBC Low and occasionally Medium Shrinkage Potential Soils.

No obvious major moisture depletion is apparent at any of these boreholes on the moisture profiles.

No noteworthy roots were encountered in boreholes, even where sunk relatively close to vegetation. The presence of more "clayey" soils in the southeast of the site where mature vegetation is present should be borne in mind when designing foundations for the proposed development but the overall risk of clay shrinkage / vegetation influence is concluded to be generally low. See Section 7.3 for recommendations.

3.3 Water Infiltration Testing

Water Infiltration Testing was carried out in boreholes BH21 and BH22 on completion of drilling according to the method for "falling head tests" outlined in BS 5930 with 1m of casing in-situ from ground level and a drilled depth below this of 0.10m BGL.

The small response zone for the tests was chosen because a high permeability was anticipated for the gravel soils encountered in the boreholes across the site. A very high permeability can make regular and reliable measurements of falling head tests difficult (as was observed at BH22 where the water completely drained in just 60 seconds); by reducing the response zone in essentially homogenous soils the drop in water level can be slowed and more measurements made throughout the test period. The response zones were entirely within natural (sandy gravel / gravelly sand) deposits and are considered to be roughly representative of the vast majority of natural subsoils at the site. A larger response zone at BH22 would have likely resulted in complete drainage in <30s with very little useful data being able to be gathered in that period.

The tests returned water infiltration rates of $4.19x10^{-6}ms^{-1}$ (0.015m/hr) at BH21 and $8.41x10^{-4}ms^{-1}$

(3.28m/hr) at BH21. Detailed results can be found on the results sheet in Appendix 2 (Infiltration Test 1 in BH21 and Infiltration Test 2 in BH22).

The returned infiltration rate for BH21 is lower than expected and may have been caused by the localised presence of a large cobble at the base of the borehole (an unfortunate potential drawback of adopting a small response zone). However, it may also be lower than expected due to a presence of soils with higher clay content being present below the drilled depth of the borehole (such as those encountered in BH11 to BH15).

The mean infiltration rate of the two tests is $4.23x10^{-4}ms^{-1}$ (1.52m/hr). It is recommended that a conservative infiltration rate of $1x10^{-4}ms^{-1}$ (0.36m/hr) be used when designing any soakaways which may be used in the proposed development, and that this value is likely to be broadly representative of the sandy gravel / gravelly sand natural subsoils encountered across the majority of the site (into which any soakaways should all discharge).

Consideration to localised variation in soil type should also be made when deciding whether to use soakaways for surface water disposal; some boreholes encountered horizons with higher clay content close to surface, particularly at boreholes BH11 to BH15 (southeast quadrant of the site) and, if utilised in these areas, soakaways may need to be excavated into the non-cohesive soils at greater depth.

3.4 CBR Testing

California Bearing Ratio tests were carried out using a hand-held Mexe-probe at trial pits TPB, TPC and TPF in near surface soils in order to determine capping requirements for road design. The trial pits were located in proposed roadways or car parking areas of the proposed development layout.

The Mexe-probe tests gave favourable results of between 3% and 6% with refusal being met where gravel soils were present.

4. Contamination Testing

The Phase 1 desk study had identified that most credible sources of made ground and/or possible contamination within the site would be; the previous development and demolition works at the site, a tank formerly present within the site, and the presence of an electricity substation at the northeast edge of the site. The alleged presence of a former boiler house between BH3 and BH4 could not be fully investigated by the current investigation due to access restrictions.

It was considered that if former land uses within and near to the site had caused contamination the contaminants would most probably occur in the near surface or shallow made ground or topsoil horizons and perhaps in deeper made (or raised) ground where present.

Therefore ten (10) samples of near-surface (≤0.50m) made ground or topsoil recovered from across the site were tested for a range of substances together with samples of deeper fill (1.50m to 2.40m) where relevant. These included common contaminants such as Arsenic, Lead and Cadmium which are normally included in a general human health contamination suite together with analysis for Speciated PAHs and Asbestos. In addition, testing was also carried out for petroleum hydrocarbons and BTEX (benzene,

toluene, ethyl benzene and xylene) where deemed appropriate (including on samples from BH5 and BH6 close to the former tank location) as was testing for PCBs on soils from close to the substation location (BH19). Leachate from three (3) of the samples was analysed also to check for potential contaminant mobility.

The results of the contamination testing are included in the Chemtech Environmental Ltd. Report presented in Appendix 3 of this report and have been used in the contamination risk assessment set out in the following sections.

5. Risk Assessment

5.1 Method

Geoinvestigate Ltd. uses a combination of assessment criterion provided by the environment agency, DEFRA and by the Chartered Institute of Environmental Health; Environment Agency Environmental Quality Standards (EQSs) Soil Guideline Values (SGVs), Site Specific Assessment Criteria (SSAC) generated using CLEA software version 1.06 site specific risk assessment modelling, DEFRA Category 4 Screening Levels (C4SLs), and Land Quality Management / Chartered Institute of Environmental Health (LQM/CIEH) Safe for use Levels (S4ULs) in order to assess the presence of potentially harmful chemicals within soils and water.

As the whole of the site is to be developed as a residential development, it falls within the residential end-use category. As it is possible that persons living on the site will cultivate vegetables / fruit for consumption, consideration to this end is considered necessary.

In this instance it has not been considered appropriate to generate site specific assessment criteria (SSAC) as no unusual circumstances are considered to exist that might render the generic assessment criteria unsuitable.

The results of the contamination testing that has been carried out have been compared to the soil quality values from the above sources. Where they fall below these limit values they have been deemed safe for a residential end use.

Where results are above the intervention values, an assessment of the available pathways and receptors has been carried out to determine whether further investigation or remediation is necessary.

An appraisal of the chemical results and relevant limits is set out in the Contamination Risk Assessment that follows.

5.2 Contamination Risk to Identified Receptors

5.2.1 Contamination Risk to Human Health

Topsoil and/or made ground was found to extend generally to depths of up to 1.30m below the majority of the site while made ground was found to extend to greater depths at some locations, extending to; 2.10m at BH2, 3.20m at BH4, 3.80m at BH5 and to 2.40m at BH20. The majority of made ground at the site was found to comprise gravel fill with gravel constituents mostly comprising just sandstone, brick and

concrete. Occasionally, ash, slag, wood and metal fragments were noted within the made ground also. No horizons exhibiting any visual or olfactory evidence of contamination were encountered at the site (such as hydrocarbon residues or odours etc.), nor was there any visible evidence of Asbestos contamination such as roofing board. Some darker colouration and/or staining was noted in some of the fill materials encountered in the boreholes but this would not necessarily be inferred to be representative of potential contamination.

In light of this it was anticipated that if chemical contamination was likely to pose a significant hazard for the new development and its users this would most likely be where ash/slag was present in made ground, due to the potential for such material to contain elevated levels of metals/PAHs, or where large quantities of made ground were present. These hypotheses would clearly need to be confirmed by soil analyses however; consequently, ash/slag containing fill material from BH6 and TPE have been analysed and deeper fill material from BH4 and BH5 have been analysed

As discussed earlier in the report, levels of determinands have been compared to the adopted assessment criteria for residential end-use as published by the Environment Agency, DEFRA and LQM/CIEH.

The results of the analyses of ten (10) samples of soil recovered from the site from depths up to 2.40m returned concentrations of a range of substances mostly falling below respective assessment criteria adopted from the sources named above. Exceptions to this are discussed in the following sections.

A summary of the returned soil concentrations together with their respective adopted assessment criteria are presented in Table 1 on the following page.

Analyses of leachates are discussed in the following section.

A mean Total Organic Carbon Content (TOC) of 2.03% and mean Soil Organic Matter Content (SOM) of 3.51% (estimated from the TOC) were returned from the soil analyses; therefore the LQM/CIEH GAC for PAHs and Hydrocarbons were chosen using the Soil Organic Matter (SOM) option of 2.5% (lower than the estimated value).

Table 1: Chemical Determinands in soils.

	Range of Returned concentrations (mg/kg)	Residential EA SGV or DEFRA C4SL (mg/kg)	LQM/CIEH S4UL* (mg/kg)
Asbestos	None detected (5 samples) **Chrysotile Asbestos (1 sample)**	Any presence unacceptable	
Arsenic	2.0-12	32/37***	37
Boron	0.4-1.9		290
Cadmium	<0.2-0.6	10/26***	11
Chromium VI	<1 (all 10)	21***	6
Chromium III	32-117		910
Copper	5.3-43		2,400
Lead	13-**391**	200***	
Mercury (elemental)	<0.5 (all 10)	1	1.2
Nickel	9.7-30		180
Selenium	0.5-1.2	350	250
Zinc	47-370		3,700
pH	6.9-10.3	See Report Section 7.4 "Concrete Design"	
Water Soluble SO_4	<10-1768		
Phenol	<0.5 (all 10)	420	550
Total PAH	<0.27-10.1		
PAH Naphthalene	<0.01-0.27		5.6
PAH Acenapthylene	<0.01 (all 10)		420
PAH Acenapthene	<0.01-0.45		510
PAH Fluorene	<0.01-0.17		400
PAH Phenanthrene	<0.02-1.68		220
PAH Anthracene	<0.02-0.45		5400
PAH Fluoranthene	0.03-1.92		560
PAH Pyrene	<0.02-1.44		1200
PAH Benzo[a]anthracene	<0.02-0.72		11
PAH Chrysene	<0.02-0.74		22
PAH Benzo(b)fluoranthene	<0.02-0.81		3.3
PAH Benzo(k)fluoranthene	<0.02-0.36		93
PAH Benzo(a)pyrene	<0.02-0.67	5***	2.7
PAH Indeno(123-cd)pyrene	<0.02-0.39		36
PAH Dibenzo(a,h)anthracene	<0.02-0.06		0.28
PAH Benzo(ghi)perylene	<0.02-0.36		340
Benzene	<0.01 (all 7)	0.33/0.87***	140 (Aromatic TPH C5-C7)
Toluene	<0.01 (all 7)	610	140 (Aromatic TPH C5-C7)
Ethylbenzene	<0.01 (all 7)	350	290 (Aromatic TPH C7-C8)
m & p-Xylene (combined)	<0.02 (all 7)	240 (m-) & 230 (p-)	290 (Aromatic TPH C7-C8)
o-Xylene	<0.01 (all 7)	250	290 (Aromatic TPH C7-C8)
TPH Aromatic C5-C7	<0.01 (all 7)		140
TPH Aromatic C7-C8	<0.01 (all 7)		290
TPH Aromatic C8-C10	<0.01-0.01		83
TPH Aromatic C10-C12	<1 (all 7)		180
TPH Aromatic C12-C16	<1 (all 7)		330
TPH Aromatic C16-C21	<1-2		540
TPH Aromatic C21-C35	<1-3		1500
TPH Aromatic C35-C44	<1 (all 7)		1500
TPH Aliphatic C5-C6	<0.1 (all 7)		78
TPH Aliphatic C6-C8	<0.1 (all 7)		230
TPH Aliphatic C8-C10	<0.1 (all 7)		65
TPH Aliphatic C10-C12	<4 (all 7)		330 (118)**
TPH Aliphatic C12-C16	<4-13		2,400 (59)**
TPH Aliphatic C16-C35	<10-117		92,000 (21)**
TPH Aliphatic C35-C44	<10-29		92,000 (21)**

*For residential use with allowance for plant uptake / consumption of homegrown produce and SOM of 2.5% where relevant.

**Value in parentheses denotes estimated soil saturation limit above which a possibility of free-phase contamination might exist in soil.

***DEFRA C4SL for residential use with allowance for plant uptake / consumption of homegrown produce.

As can be seen from the results in Table 1a and the detailed results presented in Chemtech Environmental Ltd report 73388(1) (Appendix 3) the results of contamination analyses of soils recovered from the proposed residential development area of the site have generally returned levels of potential contaminants below the adopted soil assessment criteria though with some notable exceptions:

- While asbestos was found to be absent from five of the six samples inspected, Chrysotile asbestos was discovered in the sample recovered from 0.40m in TPA.
- The same sample from TPA and near surface fill material from BH19 returned slightly elevated lead (Pb) concentrations at 391mgkg^{-1} and 390mgkg^{-1} respectively (the adopted assessment criterion for Pb is 200mgkg^{-1}). However, the mean soil Pb concentration is just 131mgkg^{-1}.

Negligible levels of petroleum hydrocarbons and PCBs were returned wherever soils were analysed. Levels of aliphatic hydrocarbons for carbon number fractions C16-C35 and C35-C44 have been returned very slightly in excess of the estimated soil saturation limits for these soils but well below their respective safe for use levels. On occasion exceedances of estimated soil saturation limits might be inferred to represent some risk of free phase contamination being present in the soils (i.e. not adsorbed onto the soil structure). However, this is not considered to be the case for these results given the extremely low returned soil concentrations and the lack of any visual or olfactory evidence of possible hydrocarbon contamination in any soils uncovered by the investigation works throughout the site.

5.2.2 Contamination Risk to Controlled Waters

5.2.2.1 Leachate analysis

Given the possible sources of historical contamination, leachate was analysed from three (3) soil samples obtained from BH5, BH10 and TPE. This screening returned generally negligible concentrations and concentrations below detectable limits and/or safe levels for domestic water supply or the protection of aquatic life levels as published by the Environment Agency which were used as the assessment criteria (EQSs). The results of the testing and the assessment criteria are shown Table 2 on the following page.

Table 2: Chemical Determinands in Leachate

	Returned Concentrations (µg/l)	UK Standard for Surface Waters intended for Drinking Water Abstraction* (DW) and/or protection of Aquatic Life in surface waters* (Aq) (µg/l)
Inorganic Chemicals		
Arsenic	0.40-5.81	**50** (DW, range: 50-100) (No Aq standard)
Boron	13-20	**1000** (DW & Aq)
Cadmium	<0.07-0.11	**5** (DW & Aq)
Chromium	<0.2-0.3	**50** (DW) / **5** (Aq, range: 5-250)
Copper	3.5-9.6	**50** (DW) / **5** (Aq, range: 5-112)
Lead	1.2-14.9	**50** (DW) / **4** (Aq, range: 4-250
Mercury (elemental Hg)	<0.008 (all)	**1** (DW & Aq)
Nickel	<0.5-1.9	**20**** (DW) / **50** (Aq, range: 50-200)
Selenium	0.26-0.74	**10** (DW) (No Aq standard)
Zinc	2-22	**3000** (DW, range: 3000-5000) / **30** (Aq, range: 30-2000)
pH	7.9-8.7	**Range 5.5 to 10** (UK drinking water standards)
Organic Chemicals		
Phenols	<10 (all)	**50****(DW) / **300** (Aq)
PAHs (total)	<1.6*** (all)	**0.2** (DW, range: 0.2-1.0) (No Aq standard)

*sourced from Environment Agency database at http://evidence.environment-agency.gov.uk/ChemicalStandards/home.aspx.
If more than one option is available (dependant on other water properties or environmental setting) the lowest value has been adopted.
**Standard for water supply as no standard available for surface water abstraction for drinking water.
***Sum of USEPA 16, each at Lower Limit of Detection of <0.1

As can be seen from Table 2 and the detailed results presented in Chemtech Environmental Ltd report 73388(1) (Appendix 3) soils from the site have been shown to be capable of leaching only negligible levels of potential contaminants and as such are not considered to pose a potential risk to the local surface and ground waters.

Concentrations of TPH and Phenol are negligible and below detectable limits for all of the analysed leachates and would not be considered to pose a risk to controlled waters. The returned pH levels of between 7.9 and 8.7 lie within the acceptable range (pH 5.5 to pH 10) for pH as per UK drinking water standards.

Leachate from up to two of these samples exhibited very minor exceedances of the lowest assessment criteria options for copper and lead. These options relate to freshwater with very low calcium carbonate content (<50mgl^{-1}) which is unlikely in water of pH 7.9 to 8.7 as measured for these leachates (low $CaCO_3$ content would be expected to be more likely in more acidic waters). Though no data has been collected regarding the calcium carbonate content of local waters and underlying groundwater the low concentrations and consequently very minor nature of the exceedances suggests that these results do not represent any significant risk to underground waters. Moreover, all analysed leachates would pass standards for Drinking Water Abstraction for these metals.

In summary, the leachate testing returned negligible concentrations of determinands which would generally pass local drinking water and ground water quality standards and soils would therefore not be considered to pose a threat to surface or underground waters.

5.3 Review of Results

The data presented in Tables 1 and 2 and the associated discussion show that the majority of soils and leachates analysed from the site returned negligible concentrations of potential contaminants and as such surface and sub-soils are generally considered to be uncontaminated and fit for purpose in the context of the proposed residential end use.

However, two samples returned slightly elevated levels of lead (Pb), and one of these (from TPA) was found to contain chrysotile asbestos.

The slightly elevated Pb concentration of these two samples is not considered to be of significant concern. The mean soil Pb concentration (of the ten analysed samples) is just 131 $mgkg^{-1}$ which is comfortably lower than the adopted soil assessment criterion of 200 $mgkg^{-1}$. As the majority of the made ground at the site is very comparable in composition (largely sandstone and brick rubble) it is considered appropriate to use the mean value as a representative condition of the soil mass as a whole; slightly elevated Pb may be present in places but this is not representative of the soils as a whole and the elevated levels are such that significant concern would not normally be inferred from their sporadic presence.

The near surface fill material at TPA which was found to contain chrysotile asbestos however remains a potential issue at the site.

Remedial works will be required at the site prior to its redevelopment but the necessary scale/scope of these works should be refined with additional soil sampling/asbestos analysis in the vicinity of TPA.

At present the full affected area/depth is unclear and could be assumed to be quite large. As it is not only economically unfavourable but also environmentally undesirable to unnecessarily dispose of soils to landfill, additional testing would be advisable and can very often drastically reduce remedial costs/impacts.

As mentioned previously in this report, anecdotal evidence has been provided by an occupant of the neighbouring residential property about a former boiler house allegedly located between BH3 and BH4 of this investigation. The large amount of demolition rubble in this area has prevented full investigation of this possibility and the additional works proposed above should also be used to further investigate the potential for contamination to have arisen associated with the alleged boiler house location. Obviously these works would need to be undertaken following removal of the raised area of fill material.

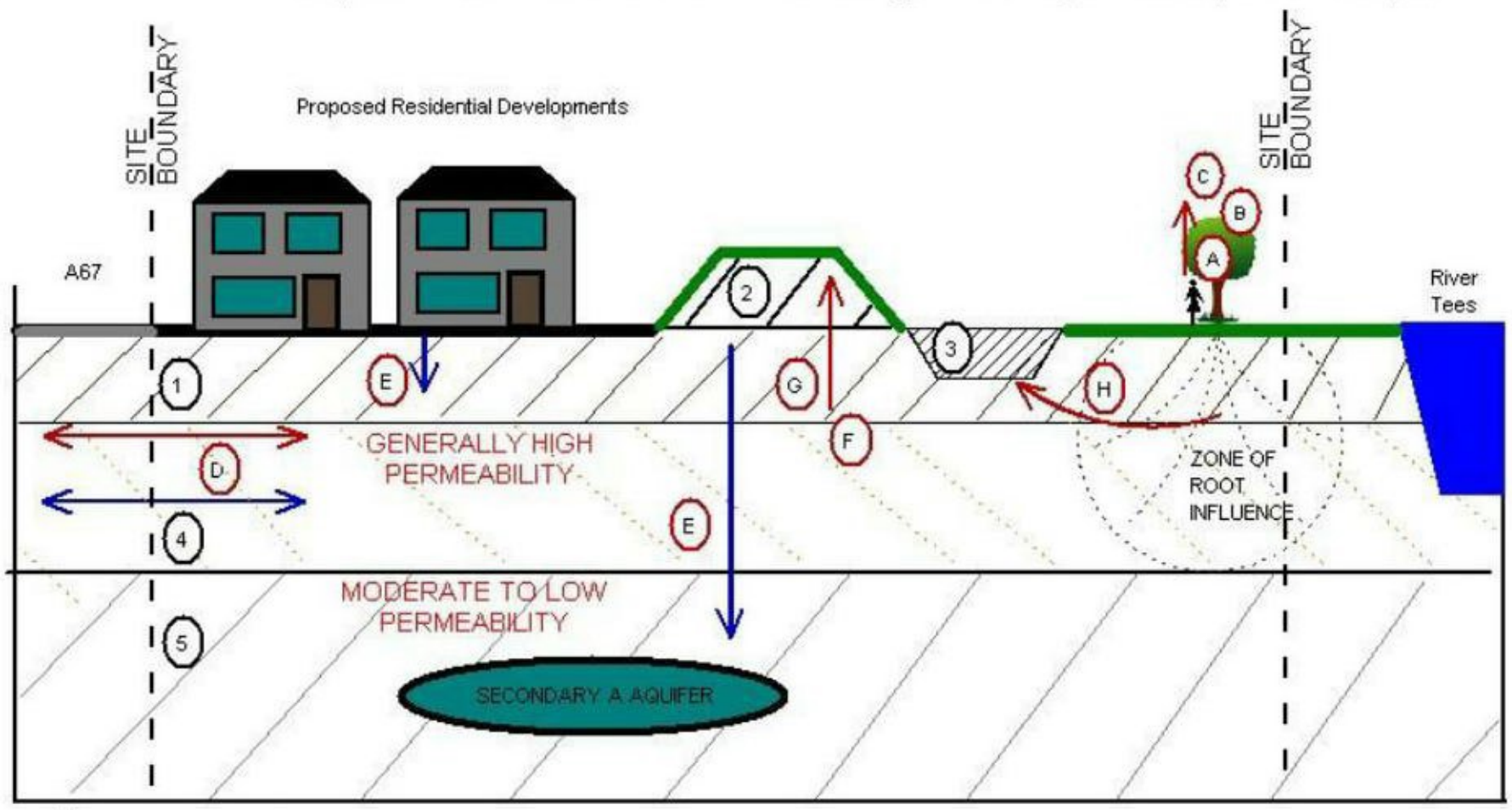
No risk has been identified to ground and/or surface waters through contaminant mobility.

5.3.1 CGHM

The conceptual ground hazard model (CGHM) presented on the following page shows the potential hazards and pollutant linkages which have been considered at the site, some of which would be considered to be present and complete if the site were to be developed for residential use in its current condition.

Note that the gas monitoring exercise is currently ongoing though no significant risk has been identified to date.

Figure 1: CGHM – Conceptual cross section of site including a Source, Pathway and Receptor Model



1. TOPSOIL OR SHALLOW MADE GROUND HORIZON THROUGHOUT MUCH OF SITE.
2. AREA OF BUILT-UP GROUND. MADE GROUND COMPRISING UNCONTAMINATED (LARGELY BRICK AND SANDSTONE GRAVEL) FILL.
3. LOCALISED AREAS OF DEEPER MADE GROUND.
4. SUPERFICIAL GEOLOGY - RIVER TERRACE DEPOSITS (GRAVEL, SAND AND SILT)
5. BEDROCK GEOLOGY - STAINMORE FORMATION (MUDSTONE, SILTSTONE AND SANDSTONE)

IDENTIFIED HAZARDS Including Potential CONTAMINATION SOURCES

-On site development and demolition activites. Former presence of a tank and a possible boiler house also noted.
-Nearby historical industrial features (i.e. sewage works).
-Nearby residential development likely including utilities and services.
-Electricity Substation on site.
-Possible made ground on and near to site due to demoltion activites.
-Hazardous gas sources from possible made ground on and near to site.

IDENTIFIED RECEPTORS and ASSOCIATED PATHWAY

A - End Users through Direct Contact / Inhalation / Ingestion. Buildings and hard-standing will encompass all of the site, removing any pathway to end users through direct contact in these areas. However, limited soft landscping present near to proposed development area.
B - Plants and Trees through uptake.
C - End Users through cultivation and consumption of vegetables / fruit. Highly unlikely or impossible given the intended layout and end use of the site (holiday cottages).
D - Neighbouring Sites through lateral migration (in soil and water, including surface water run-off).
E - Ground water through leaching of sub-soil.
F - Buildings and services through direct contact.
Linkages A-F shown largely to be absent save for:
-Possible former boiler house requiring additional invesitgation once accessible.
-Identification of chrysotile asbestos at TPA only. Remedial works required.
G - End users and buildings through ground gas migration.
Monitoring exercise ongoing though no significant risk identified to date.
H - Buildings through tree root influence and seasonal shrink/swell of clays.
Potential risk identified in southeast of site but sufficiently mitigated by correct foundation design (see report sections 3 and 7.3 for details).
(Negligible risk across majority of site.)

6. Hazardous Gas

6.1 Gas Regime

To quantify the ground gas risk at the site a set of six monitoring visits over three months in wells installed in boreholes BH4, BH10 and BH14. To date two of these monitoring visits have been carried out to provide some idea of the gas situation at the site prior to the issue of this report with the following three scheduled to take place in the coming weeks/months (addendum report to be issued thereafter confirming findings of gas monitoring).

The initial results of gas monitoring at the site are presented in Table 3 below.

A further set of up to four measurements may be required to properly establish the longer term gassing regime at the site.

Table 3 Summary of Gas Monitoring Data

Borehole	Number of Visits	CH_4 (%)	CO_2 (%)	O_2 (%)	Flow Rate (l/hr)	Atmospheric Pressure (mb)
BH4	2	<0.1 (both)	0.4-0.5	20.2 (both)	<0.1	999-1003
BH10		<0.1 (both)	2.1-2.4	18.1-18.9	<0.1-0.9	
BH14		<0.1 (both)	1.5 (both)	19.4-19.8	<0.1-0.6	

The two gas monitoring visits carried out to date at atmospheric pressures of between 999mb and 1003mb returned near normal levels of O_2 of between 18.1% and 20.2%, levels of CH_4 consistently below detectable limits (<0.1%), and low levels of CO_2 between 0.4% and 2.4%.

Small amounts of positive flow (flow out from the borehole) were measured at boreholes BH10 and BH14 on the second monitoring visit. The reason for this is unclear but on occasion wind can affect the sensitive monitoring equipment and this may have been the case in this instance. No obvious cause for gas flow can be identified from the ground conditions at these boreholes (or generally throughout the site) and it may be that this phenomenon is not observed again during the continuing gas monitoring exercise. The subsequent monitoring visits will confirm or deny this possibility but for now it will be assumed for the sake of prudency that this is the constant condition at this part of the site. Gas flow rates were otherwise consistently <0.1 l/hr and below detectable limits.

According to CIRIA C665 guidance the gas screening values (GSVs) in l/hr for each of the monitored boreholes are 0.0005 (BH4), 0.0216 (BH10), and 0.009 (BH14) assuming a worst case situation for each (i.e. maximum observed flow and CO_2 content).

6.2 Radon Gas

The desk study findings confirmed that Radon protection is not necessary for new buildings at the site.

7. Conclusions

7.1 Contamination

Analysis of the ground conditions at the site and an assessment of the potential pathways have confirmed that the majority of soils at the site are uncontaminated and fit for purpose in the proposed residential end use.

However, the presence of chrysotile asbestos in a single sample of near-surface granular fill material recovered from TPA will necessitate a remediation exercise to remove potential pollutant linkages which would remain present and complete if the site were to be developed for residential use in its current condition.

Two uncertainties remain about the site with regard to potential contamination. The first of these comprises the full extent of the area around TPA affected by asbestos contamination while the second pertains to the alleged location of a former boiler house between BH3 and BH4 of this investigation; full investigation of this area was not possible during this investigation due to access restrictions (rubble heap/built-up ground).

Therefore, it is recommended that an additional phase of site investigation works be undertaken following removal (or relocation) of the built-up ground in the vicinity of the possible former boiler house location. Where analysed, the material in this mound has been shown to be uncontaminated (samples of fill taken from BH4 and BH5 have both been analysed).

Additional works need not be extensive; near surface sampling and analysis of made ground and potentially natural subsoils in these two areas should be sufficient, possibly through either a machine trial pitting exercise or a number of 1m-2m deep boreholes. Analysis for asbestos content should be the focus in the northeast of the site around BH19 to establish the spatial extent and depth of affected soils, while a more general suite of potential contaminants should be considered around the possible former boiler house location (including both fuels and products of combustion such as PAHs and trace metals).

Topsoil and natural subsoils have been found to be uncontaminated where analysed (as has the majority of made ground at the site) and no risk to local ground and/or surface waters has been identified.

Once full knowledge of the contamination situation at the site is in hand and the full area(s) requiring remediation have been established, a Remediation and Validation Strategy document should be compiled and submitted to the Local Planning Authority for review prior to commencing the remedial works. A Validation Report will also be required on completion of these works showing their prudent and successful implementation leaving the site suitable for residential development.

7.2 Hazardous Gas

Monitoring undertaken to date has consistently returned GSVs of ≤0.0216 l/hr. On the basis of these initial gas results the gas conditions at the site would be expected to fall within “Characteristic Situation 1” (CS1) of the Modified Wilson and Card classification (CIRIA C665).

Consequently, on the basis of these results and assuming a worst-case scenario, no special gas protection measures will be required in the construction of the new buildings at the site.

As only two gas monitoring visits have been carried out to date, up to a further four sets of gas monitoring results may need to be obtained before a final decision can be made on the level of gas protection required at the site and the associated risk may increase (though this is thought relatively unlikely). These visits have been scheduled to be carried out over the coming weeks/months and the final results will be provided in an addendum to this report when they are complete.

Note that the above assumes that most of the material making up the artificially raised area(s) of the site will be removed prior to development, though the conclusions would essentially be unchanged if the full thickness were to remain because where made ground has been monitored, no noteworthy risk has been identified to date.

7.3 Foundations & Floors

Generally competent natural sandy gravel / gravelly sand natural subsoils have been encountered throughout the site from shallow depth and/or from the commencement of natural subsoils below any made ground deposits which are present.

The only exception to this would be at BH6 where less competent natural strata are present to 2.60m BGL. This may be due to the possible presence of an infilled drainage ditch/excavation where water flow/leakage may have softened soils or washed out finer particles from the soil matrix. If this is found to be true, the same should be assumed for the full route of the feature through the site.

With the exception of the above, normal reinforced strip foundations may be seated in natural subsoils throughout the site. Save for at BH6, SPT N values of no less than N=10 and shear vane test results in more cohesive soils of no less than 66kNm^{-2} have been returned for the natural subsoils.

Made ground (where present) generally extends to up to 1.30m across the site with some notable thicker deposits largely concerned with raised areas discussed earlier in this report. It should be noted however that BH20 in the east of the site encountered deeper made ground possibly associated with an in-filled basement feature.

Generally, this would mean that strip foundations seated below the full depth of made ground would need to be between 1.0m and 1.5m deep. At these depths, and referring to the lowest SPT N value of N=10 as a worst-case scenario, foundations may be designed assuming a net bearing capacity of 90kPa.

The absence of any noteworthy roots from the soils encountered in the boreholes and the largely non-plastic nature of the soils would suggest that vegetation influence and shrink-swell clays pose a negligible risk to the proposed development. It is noted that a higher clay content was present in shallower soils in the southeast of the site (BH10-BH15); as some mature trees are present within and close to this part of the site it would be advisable to extend foundations to greater depth in this part of the site as a precautionary measure (ca. 2.0m BGL) and to include some anti-heave protection on the internal faces of foundations.

Either a ground bearing floor slab or a suspended block and beam floor will be sufficient for new structures in most areas of the site though a suspended block and beam floor will be more appropriate where some risk of potential vegetation influence (and/or heave) has been identified.

7.4 Concrete Design

The results of chemical analyses of the fill returned Water Soluble Sulphate levels of between <10mgl^{-1} and 1768mgl^{-1} (though generally below 150mgl^{-1} and with a mean value of 228mgl^{-1}) and pH levels of between 6.9 and 10.3 (with a mean of 8.5). On this basis concrete in contact with the ground may be designed to ACEC Class DS-1 AC-1s of "BRE Special Digest 1 – Concrete in aggressive ground".

7.5 Soakaways

Generally, sandy gravel / gravelly sand soils have been encountered throughout the site which have been shown to exhibit good infiltration rates by water infiltration testing.

Adoption of a representative infiltration rate of 1x10^{-4}ms^{-1} (0.36m/hr) is recommended when designing any soakaways which may be used in the proposed development. This value is likely to be broadly representative of the sandy gravel / gravelly sand natural subsoils encountered across the majority of the site (into which any soakaways should all discharge).

Where soils with higher clay content are present close to surface in the southeast of the site (BH10-BH15) it is recommended that soakaways be excavated to greater depth where their discharge will be into more granular soils of higher permeability.

7.6 Roadways and Parking

CBR values returned by handheld Mexeprobe testing of ≥3%suggests that a subbase of minimum 250mm thickness will be appropriate for roadways and parking throughout the site (according to NHBC guidance).

END OF REPORT

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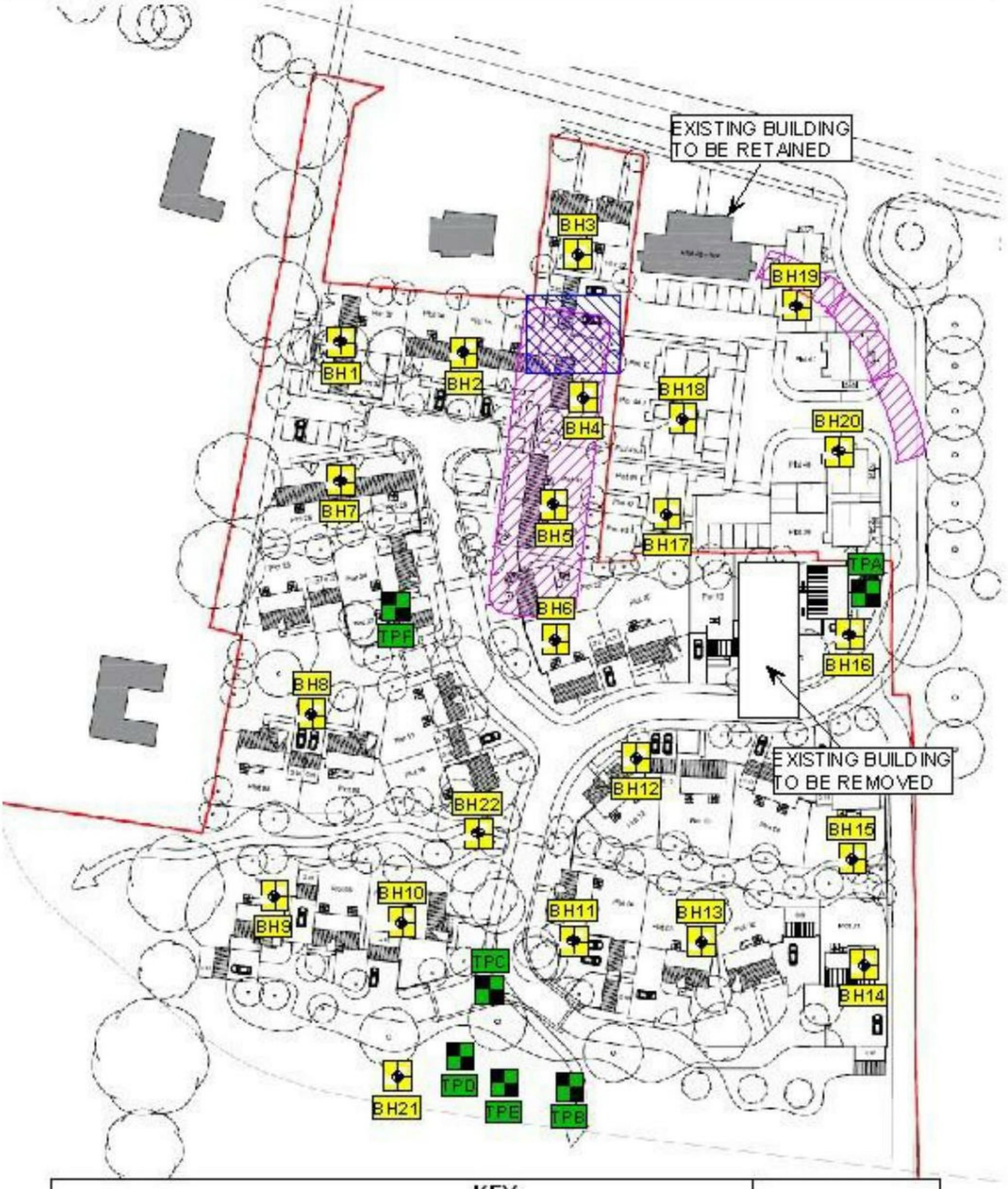
APPENDIX 1

Site Plan

and

Borehole/Trial Pit Logs

OUR REF: G18214b	YOUR REF:	SITE PLAN (NOT TO SCALE)
DATE: July 2018	LOCATION: Proposed Dvelopment, Main Road, Gainford, Darlington, DL2 3BQ	



GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G8214b **BH No.1** **Sheet No. 1 of 1**
Location: Land at Main Road, Gainford, Darlington, DL2 3BQ **DATE**: 20/07/18

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	SPT N Value (Depth)	Depth to Water	Depth (m)
0.10	TURF and TOPSOIL. Loose brown clayey gravelly sand.	100				Cv kN/m^2			
0.30	MADE GROUND. Compact yellow dolomitic limestone gravel.	200			O				0.25
0.40	MADE GROUND. Compact black fine to coarse gravel of asphalt and brick.	100			O				0.50
0.85	MADE GROUND. Medium dense dark brown clayey sandy gravel / clayey gravelly sand. Gravel is fine to coarse of sandstone, brick, concrete and coal.	450					1.00m-1.45m 2,2,3,3,4,4 N = 14		0.75
	Medium dense brown clayey sandy GRAVEL / clayey gravelly SAND. Gravel is fine to coarse of sandstone and coal. Cobbles noted.				O				1.00
									1.25
					O				1.50
							2.00m-2.45m 6,9,9,9,10,10 N = 38		1.75
					O				2.00
	Becoming orangish brown and dense below 2.20m								2.25
		3150			O				2.50
	Becoming moist below 2.60m								
	Becoming loose to medium dense below 2.80m								2.75
							3.00m-3.45m 3,3,3,3,3,3 N = 12		
					O				3.00
									3.25
					O				3.50
									3.75
4.00					O		4.00m-4.45m 3,3,3,3,3,3 N = 12		4.00
	Borehole Terminated at 4.00m								

Remarks:
Casing to 1.00m
Dynamic windowless sampling by Terrier Rig to 4.00m
Borehole remained open and dry on completion

Key:
Slotted Pipe
Plain Pipe
Bentonite
Gravel Filter

O Disturbed sample
Cv Shear vane
W Water sample
S Standard Penetration Test

BH1

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G8214b **BH No.2** **Sheet No. 1 of 1**
Location: Land at Main Road, Gainford, Darlington, DL2 3BQ **DATE**: 20/07/18

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	SPT N Value (Depth)	Depth to Water	Depth (m)
0.10	TURF and TOPSOIL. Loose brown clayey gravelly sand. Gravel is fine to coarse of sandstone and brick.	100				Cv kN/m²			
	MADE GROUND. Medium dense brown sandy gravel and cobbles of sandstone and brick.	800			O				0.25
0.90					O				0.50
	MADE GROUND. Medium dense brown and dark brown slightly clayey sandy gravel. Gravel is fine to coarse of sandstone and occasional brick. Cobbles noted.						1.00m-1.45m 3,3,3,4,4,4 N = 15		0.75
2.10		1200			O				1.00
									1.25
					O				1.50
							2.00m-2.45m 4,4,4,5,5,5 N = 19		1.75
					O				2.00
	Medium dense oranglsh brown sandy GRAVEL. Gravel is fine to coarse of sandstone.								2.25
		1200			O				2.50
3.30							3.00m-3.45m 4,5,4,4,4,5 N = 17		2.75
	Medium dense greyish brown clayey sandy GRAVEL / clayey gravelly SAND. Gravel is fine to coarse of sandstone. Moist.				O				3.00
									3.25
					O				3.50
		700					4.00m-4.45m 3,3,3,3,4,4 N = 14		3.75
4.00					O				4.00
	Borehole Terminated at 4.00m Roots to 3.20m								

Remarks:
Casing to 1.00m
Dynamic windowless sampling by Terrier Rig to 4.00m
Borehole remained open and dry on completion

Key:
Slotted Pipe
Plain Pipe
Bentonite
Gravel Filter

O Disturbed sample
Cv Shear vane
W Water sample
S Standard Penetration Test

BH2

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G8214b **BH No.3** **Sheet No. 1 of 1**
Location: Land at Main Road, Gainford, Darlington, DL2 3BQ **DATE**: 20/07/18

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	SPT N Value (Depth)	Depth to Water	Depth (m)
	TURF and TOPSOIL. Loose orangish brown clayey gravelly sand. Gravel is fine to coarse of sandstone and occasional	400				Cv kN/m^2			0.25
0.40	brick.				O				
	Medium dense orangish brown sandy GRAVEL and COBBLES of sandstone.								0.50
									0.75
							1.00m-1.45m 8,9,9,9,8,8 N = 36		
					O				1.00
									1.25
		2100							
					O				1.50
									1.75
							2.00m-2.45m 4,4,4,5,5,5 N = 19		
					O				2.00
									2.25
2.50					O				2.50
	Borehole Terminated at 2.50m due to refusal								

Remarks:
Casing to 1.00m
Dynamic windowless sampling by Terrier Rig to 2.50m
Borehole remained dry on completion
Borehole closed below 1.30m on completion

Key:
Slotted Pipe
Plain Pipe
Bentonite
Gravel Filter

O Disturbed sample
Cv Shear vane
W Water sample
S Standard Penetration Test

BH3

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G8214b **BH No.4** **Sheet No. 1 of 1**

Location: Land at Main Road, Gainford, Darlington, DL2 3BQ **DATE:** 20/07/18

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	SPT N Value (Depth)	Depth to Water	Depth (m)
0.30	TURF and TOPSOIL. Loose orangish brown clayey gravelly sand. Gravel is fine to coarse of sandstone and brick.	300				Cv kN/m^2			0.25
2.80	MADE GROUND. Compact red and grey sandy gravel. Gravel is fine to coarse and cobbles of brick and concrete.	2500			O O O O O O				0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 2.75
3.20	MADE GROUND. Loose dark brown and orangish brown clayey gravelly sand / clayey sandy gravel. Gravel is fine to coarse of sandstone and occasional brick.	400			O				3.00 3.25
4.00	Medium dense dark orangish brown sandy GRAVEL. Gravel is fine to coarse of rounded flint. Cobbles noted.	800			O O		4.00m-4.45m 7,7,8,6,7,7 N = 28		3.50 3.75 4.00
	Borehole Terminated at 4.00m								

Remarks: Casing to 1.00m
Dynamic windowless sampling by Terrier Rig to 4.00m
Borehole remained dry on completion
Borehole closed below 1.60m on completion
Gas well installed to 1.60m with gas bung and cover

Key:

	Slotted Pipe	**O**	Disturbed sample
	Plain Pipe	**Cv**	Shear vane
	Bentonite	**W**	Water sample
	Gravel Filter	**S**	Standard Penetration Test

BH4

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G8214b **BH No.5** **Sheet No. 1 of 1**
Location: Land at Main Road, Gainford, Darlington, DL2 3BQ **DATE:** 20/07/18

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	SPT N Value (Depth)	Depth to Water	Depth (m)
	TURF and TOPSOIL. Loose orangish brown clayey gravelly sand. Gravel is fine to coarse of sandstone and occasional brick.	1100			O	Cv kN/m²			0.25 0.50 0.75
1.10					O				1.00
	MADE GROUND. Loose red and grey sandy gravel. Gravel is fine to coarse of brick and concrete. Cobbles noted.	2300			O O O O O				1.25 1.50 1.75 2.00 2.25 2.50 2.75 3.00 3.25
3.40									
	MADE GROUND. Soft/loose dark brown and orangish brown very sandy clay / clayey sand. Possibly buried topsoil.	400			O				3.50 3.75
3.80							4.00m-4.45m 1,2,3,2,3,2 N = 10		
4.00	Medium dense orangish brown sandy GRAVEL. Gravel is fine to coarse of reounded sandstone. Cobbles noted.	200			O				4.00
	Borehole Terminated at 4.00m								

Remarks:
Casing to 1.00m
Dynamic windowless sampling by Terrier Rig to 4.00m
Borehole remained dry on completion
Borehole closed below 2.60m

Key:
Slotted Pipe
Plain Pipe
Bentonite
Gravel Filter

O Disturbed sample
Cv Shear vane
W Water sample
S Standard Penetration Test

BH5

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G8214b **BH No.6** **Sheet No. 1 of 1**
Location: Land at Main Road, Gainford, Darlington, DL2 3BQ **DATE**: 20/07/18

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	SPT N Value (Depth)	Depth to Water	Depth (m)
0.20	TURF AND TOPSOIL. Brown gravelly sand. Gravel is fine to coarse of sandstone.	200							0.25
0.40	MADE GROUND. Loose pale brown sandy gravel / gravelly sand. Gravel is fine to coarse and cobbles of sandstone and brick.	200							
0.70	MADE GROUND. Loose black gravelly sand. Gravel is fine to coarse of coal, ash, slag and small woody fragments. Brick cobble 0.60m to 0.70m	300			O				0.50
1.00	MADE GROUND. Blackish brown sandy gravel. Gravel is fine to coarse and cobbles of brick and sandstone.	300							0.75
1.30	MADE GROUND. Loose dark brown mottled black gravelly clayey sand. Gravel is fine to coarse of sandstone, coal and slag with wood fragments.	600			O		1.00m-1.45m 0,0,0,0,0,0 N = 0		1.00
1.90	Loose dark brown gravelly clayey SAND. Gravel is fine to coarse and cobbles of sandstone.								1.25
	Loose orangish brown gravelly clayey SAND. Gravel is fine to coarse of sandstone and coal.	2100			O				1.50
									1.75
							2.00m-2.45m 1,1,1,1,1,1 N = 4		2.00
					O				2.25
									2.50
	Becoming medium dense below 2.60m				O				2.75
							3.00m-3.45m 3,3,4,4,3,5 N = 16		3.00
					O				3.25
									3.50
					O				3.75
4.00									4.00
	Borehole terminated at 4.00m								

Remarks:
Casing to 1.00m
Dynamic windowless sampling by Terrier Rig to 4.00m
Borehole remained open and dry on completion

Key:
Slotted Pipe
Plain Pipe
Bentonite
Gravel Filter

O Disturbed sample
Cv Shear vane
W Water sample
S Standard Penetration Test

BH6

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G8214b **BH No.7** **Sheet No. 1 of 1**
Location: Land at Main Road, Gainford, Darlington, DL2 3BQ **DATE:** 20/07/18

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	SPT N Value (Depth)	Depth to Water	Depth (m)
0.10	TURF and TOPSOIL. Loose brown clayey gravelly sand.	100				Cv kN/m^2			
	Medium dense brown clayey gravelly SAND. Gravel is fine to coarse of sandstone.	800			O				0.25
0.90					O				0.50
	Medium dense brown sandy GRAVEL and COBBLES of sandstone.	400					1.00m-1.45m 4,4,5,4,5,5 N = 19		0.75
1.30					O				1.00
	Medium dense brown and orangish brown slightly clayey sandy GRAVEL / gravelly SAND. Gravel is fine to coarse of sandstone.				O				1.25
									1.50
							2.00m-2.45m 4,4,4,4,5,7 N = 20		1.75
					O				2.00
									2.25
	Becoming moist below 2.40m				O				2.50
		2700							2.75
	Becoming loose to medium dense below 2.90m						3.00m-3.45m 3,3,3,4,4,4 N = 15		
					O				3.00
									3.25
					O				3.50
							4.00m-4.45m 4,3,3,3,3,3 N = 12		3.75
4.00					O				4.00
	Borehole Terminated at 4.00m								

Remarks:
Casing to 1.00m
Dynamic windowless sampling by Terrier Rig to 4.00m
Borehole remained open and dry on completion

Key:
Slotted Pipe
Plain Pipe
Bentonite
Gravel Filter

O Disturbed sample
Cv Shear vane
W Water sample
S Standard Penetration Test

BH7

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G8214b **BH No.8** **Sheet No. 1 of 1**
Location: Land at Main Road, Gainford, Darlington, DL2 3BQ **DATE:** 20/07/18

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	SPT N Value (Depth)	Depth to Water	Depth (m)
0.30	TURF and TOPSOIL. Loose brown clayey gravelly sand. Gravel is fine to coarse of sandstone and brick.	300			O	Cv kN/m²			0.25
	Medium dense brown sandy GRAVEL / gravelly sand. Slightly clayey in places. Gravel is fine to coarse of sandstone. Cobbles noted below 0.60m				O				0.50
									0.75
					O		1.00m-1.45m 5,5,4,4,6,5 N = 19		1.00
									1.25
					O				1.50
									1.75
	Becoming moist below 1.90m	3700			O		2.00m-2.45m 4,4,4,4,4,4 N = 16		2.00
									2.25
					O				2.50
									2.75
					O		3.00m-3.45m 4,3,4,4,3,3 N = 14		3.00
									3.25
	Becoming grey below 3.40m				O				3.50
									3.75
4.00					O		4.00m-4.45m 3,3,3,4,4,4 N = 15		4.00
	Borehole Terminated at 4.00m								

Remarks:
Casing to 1.00m
Dynamic windowless sampling by Terrier Rig to 4.00m
Borehole remained open and dry on completion

Key:
Slotted Pipe
Plain Pipe
Bentonite
Gravel Filter
O Disturbed sample
Cv Shear vane
W Water sample
S Standard Penetration Test

BH8

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G8214b **BH No.9** **Sheet No. 1 of 1**
Location: Land at Main Road, Gainford, Darlington, DL2 3BQ **DATE**: 20/07/18

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	SPT N Value (Depth)	Depth to Water	Depth (m)
0.20	TURF and TOPSOIL. Loose brown clayey gravelly sand. Gravel is fine to coarse of sandstone and brick.	200			O	Cv kN/m^2			0.25
0.60	MADE GROUND. Dense brown sandy gravel / gravelly sand. Gravel is fine to coarse of sandstone and occasional brick.	400			O				0.50
1.60	Dense brown sandy GRAVEL. Gravel is fine to coarse of sandstone. Many cobbles below 1.10m	1000			O O		1.00m-1.45m 6,8,11, 10,12,12 N = 45 1.60m-1.75m 36,42 N=78/150mm		0.75 1.00 1.25 1.50 1.60
	Borehole Terminated at 1.60m due to refusal								

Remarks:
Casing to 1.00m
Dynamic windowless sampling by Terrier Rig to 1.60m
Borehole remained open and dry on completion

Key:
Slotted Pipe
Plain Pipe
Bentonite
Gravel Filter
O Disturbed sample
Cv Shear vane
W Water sample
S Standard Penetration Test

BH9

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G8214b **BH No.10 Sheet No. 1 of 1**

Location: Land at Main Road, Gainford, Darlington, DL2 3BQ **DATE:** 20/07/18

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	SPT N Value (Depth)	Depth to Water	Depth (m)
0.20	TURF and TOPSOIL. Loose brown clayey gravelly sand. Gravel is fine to coarse of sandstone and brick.	200				Cv kN/m^2			0.25
0.90	Firm / medium dense brown very sandy gravelly CLAY / very clayey gravelly SAND. Gravel is fine to coarse of sandstone.	700			O	64	1.00m-1.45m 8,8,9,10,10,14 N = 43		0.50 0.75
2.00	Dense brown sandy GRAVEL. Gravel is fine to coarse of sandstone. Cobbles noted. Many cobbles below 1.30m				O O O		2.00m-2.45m 11,11,14, 16,24,37 N = 91		1.00 1.25 1.50 1.75 2.00
	Borehole Terminated at 2.00m due to refusal								

Remarks:

Casing to 1.00m

Dynamic windowless sampling by Terrier Rig to 2.00m

Borehole remained dry on completion

Gas well installed to 2.00m with gas bung and cover

Key:

Slotted Pipe — O Disturbed sample

Plain Pipe — Cv Shear vane

Bentonite — W Water sample

Gravel Filter — S Standard Penetration Test

BH10

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G8214b **BH No.11 Sheet No. 1 of 1**

Location: Land at Main Road, Gainford, Darlington, DL2 3BQ **DATE:** 20/07/18

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	SPT N Value (Depth)	Depth to Water	Depth (m)
0.10	CONCRETE. No rebar or DPM	100				Cv kN/m^2			
0.30	MADE GROUND Compact black sandy gravel. Gravel is fine to coarse of brick, pot, concrete and ash. Wet.	200			O				0.25
0.70	MADE GROUND Loose brown stained black in places clayey gravelly sand / clayey sandy gravel. Gravel is fine to coarse of brick and sandstone. Occasional metal fragments noted.	400			O				0.50
									0.75
	Firm / medium dense brown clayey sandy GRAVEL / clayey gravelly SAND. Gravel Is fine to coarse of sandstone.				O		1.00 - 1.45 2/3/3/4/3/3 N=13		1.00
									1.25
		1400			O	60			1.50
	Many cobbles from 1.70m								1.75
2.10					O		2.00 - 2.45 3/3/4/5/5/7 N=21		2.00
	Medium dense brown and orangish brown sandy GRAVEL / gravelly SAND. Gravel is fine to coarse of sandstone. Cobbles noted								2.25
					O				2.50
									2.75
		1900			O		3.00 - 3.45 4/4/4/4/4/4 N=16		3.00
									3.25
					O				3.50
									3.75
4.00					O		4.00 - 4.45 7/7/7/8/7/9 N=31		4.00
	Borehole terminated at 4.00m								

Remarks:

Casing to 1.00m

Dynamic windowless sampling by Terrier Rig to 4.00m

Borehole remained open and dry on completion

Key:

Slotted Pipe

Plain Pipe

Bentonite

Gravel Filter

O Disturbed sample

Cv Shear vane

W Water sample

S Standard Penetration Test

BH11

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G8214b **BH No.12 Sheet No. 1 of 1**

Location: Land at Main Road, Gainford, Darlington, DL2 3BQ **DATE:** 20/07/18

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	SPT N Value (Depth)	Depth to Water	Depth (m)
0.08	CONCRETE. No rebar or DPM	80				Cv kN/m^2			
0.70	MADE GROUND Loose to medium dense black sandy gravel. Gravel is fine to coarse of brick and ash.	620			O				0.25 0.50 0.75
2.70	Firm / medium dense brown very sandy very gravelly CLAY / clayey very gravelly SAND. Gravel is fine to coarse of sandstone. Cobbles noted.	2000			O O O O	66 76	1.00 - 1.45 2/3/3/2/3/3 N=11 2.00 - 2.45 3/4/4/4/5/4 N=17		1.00 1.25 1.50 1.75 2.00 2.25 2.50 2.75
4.00	Medium dense brown and orangish brown slightly clayey in places sandy GRAVEL / gravelly SAND. Gravel is fine to coarse of sandstone. Cobbles noted.	1300			O O O		3.00 - 3.45 4/4/6/7/6/6 N=25 4.00 - 4.45 4/4/4/4/5/4 N=17		3.00 3.25 3.50 3.75 4.00
	Borehole terminated at 4.00m								

Remarks:

Casing to 1.00m

Dynamic windowless sampling by Terrier Rig to 4.00m

Borehole remained open and dry on completion

Key:

Slotted Pipe — **O** Disturbed sample

Plain Pipe — **Cv** Shear vane

Bentonite — **W** Water sample

Gravel Filter — **S** Standard Penetration Test

BH12

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G8214b **BH No.13 Sheet No. 1 of 1**

Location: Land at Main Road, Gainford, Darlington, DL2 3BQ **DATE**: 20/07/18

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	SPT N Value (Depth)	Depth to Water	Depth (m)
	Medium dense brown slightly clayey gravelly SAND. Gravel is fine to coarse of sandstone.					Cv kN/m^2			
					O				0.25
					O				0.50
		1300							0.75
					O		1.00 - 1.45 3/3/3/4/4/3 N=14		1.00
1.30									1.25
	Firm brown very sandy gravelly CLAY / clayey gravelly SAND. Gravel is fine to	300			O	70			1.50
1.60	coarse of sandstone and occasional coal.						1.70 - 1.71		
1.70	Hard brown sandstone boulder.	100			O		N=50 / 10mm		1.70
	Borehole terminated at 1.70m due to refusal								

Remarks:

Casing to 1.00m

Dynamic windowless sampling by Terrier Rig to 1.70m

Borehole remained open and dry on completion

Key:

Slotted Pipe

Plain Pipe

Bentonite

Gravel Filter

O Disturbed sample

Cv Shear vane

W Water sample

S Standard Penetration Test

BH13

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G8214b **BH No.14 Sheet No. 1 of 1**

Location: Land at Main Road, Gainford, Darlington, DL2 3BQ **DATE:** 20/07/18

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	SPT N Value (Depth)	Depth to Water	Depth (m)
0.30	TURF / TOPSOIL Loose brown sandy gravel. Gravel is fine to coarse of brick, sandstone and occasional pot.	300			O	Cv kN/m^2			0.25
1.20	Firm brown very sandy gravelly CLAY / clayey gravelly SAND. Gravel is fine to coarse of sandstone.	900			O O	66	1.00 - 1.45 3/4/5/5/5/4 N=19		0.50 0.75 1.00
4.00	Medium dense brown and orangish brown sandy GRAVEL / gravelly SAND. Gravel is fine to coarse of sandstone. Cobbles noted	2800			O O O O O		2.00 - 2.45 3/4/4/5/4/4 N=17 3.00 - 3.45 4/4/4/6/4/6 N=20 4.00 - 4.45 4/4/4/4/5/5 N=18		1.25 1.50 1.75 2.00 2.25 2.50 2.75 3.00 3.25 3.50 3.75 4.00
	Borehole terminated at 4.00m								

Remarks:

Casing to 1.00m

Dynamic windowless sampling by Terrier Rig to 4.00m

Borehole remained open and dry on completion

Gas well installed to 4.00m with gas bung and cover

Key:

Slotted Pipe

Plain Pipe

Bentonite

Gravel Filter

O Disturbed sample

Cv Shear vane

W Water sample

S Standard Penetration Test

BH14

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G8214b **BH No.15 Sheet No. 1 of 1**

Location: Land at Main Road, Gainford, Darlington, DL2 3BQ **DATE:** 20/07/18

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	SPT N Value (Depth)	Depth to Water	Depth (m)
0.10	CONCRETE. No rebar or DPM.	100				Cv kN/m^2			
0.25	MADE GROUND Compact yellowish brown dolomitic hardcore fill. Occasional brick noted.	150			O				0.25
	Firm / medium dense brown very sandy gravelly CLAY / clayey gravelly SAND. Gravel is fine to coarse of sandstone.	1650			O				0.50
									0.75
					O	72			1.00
									1.25
					O	80			1.50
									1.75
1.90							2.00 - 2.45 3/3/5/5/5/5 N=20		
	Medium dense brown and orangish brown slightly clayey sandy GRAVEL / gravelly SAND. Gravel is fine to coarse of sandstone. Cobbles noted. Becoming less clayey with depth.	1400			O				2.00
									2.25
					O				2.50
									2.75
					O		3.00 - 3.30 10/14/29/45 N=98 / 300mm		3.00
3.30					O				3.30
	Borehole terminated at 3.30m due to refusal								

Remarks:

Casing to 1.00m

Dynamic windowless sampling by Terrier Rig to 3.30m

Borehole remained open and dry on completion

Key:

Slotted Pipe

Plain Pipe

Bentonite

Gravel Filter

O Disturbed sample

Cv Shear vane

W Water sample

S Standard Penetration Test

BH15

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G8214b **BH No.16 Sheet No. 1 of 1**

Location: Land at Main Road, Gainford, Darlington, DL2 3BQ **DATE**: 20/07/18

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	SPT N Value (Depth)	Depth to Water	Depth (m)
	MADE GROUND. Compact yellowish brown sandy gravel / gravelly sand. Gravel is fine to coarse of sandstone, brick, concrete and occasional pot. Many cobbles.	800			O	Cv kN/m²			0.25
					O				0.50
0.80					O		0.80m-0.82m N=50/20mm		0.80
	Borehole Terminated at 0.80m due to refusal Three attempts made to sink BH16. All encountered similar ground conditions with refusal met at 0.50m, 0.70m and 0.80m.								

Remarks:

Casing to 0.80m

Dynamic windowless sampling by Terrier Rig to 0.80m

Borehole remained open and dry on completion

Key:

	Slotted Pipe	O	Disturbed sample
	Plain Pipe	Cv	Shear vane
	Bentonite	W	Water sample
	Gravel Filter	S	Standard Penetration Test

BH16

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G8214b **BH No.17 Sheet No. 1 of 1**

Location: Land at Main Road, Gainford, Darlington, DL2 3BQ **DATE:** 20/07/18

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	SPT N Value (Depth)	Depth to Water	Depth (m)
	MADE GROUND. Compact dark brown sandy gravel. Gravel is fine to coarse of sandstone, brick and occasional coal. Cobbles noted.	750			O	Cv kN/m^2			0.25
					O				0.50
0.75							1.00m-1.45m 10,10,12, 20,25,25 N = 82		0.75
	Very dense grey and dark orangish brown sandy GRAVEL and COBBLES of sandstone.	1250			O				1.00
									1.25
					O				1.50
2.00					O		2.00m-2.45m 12,12,18, 18,16,16 N = 68		1.75
									2.00
	Borehole Terminated at 2.00m due to refusal								

Remarks:

Casing to 1.00m

Dynamic windowless sampling by Terrier Rig to 2.00m

Borehole remained dry on completion

Borehole closed below 1.80m on completion

Key:

Slotted Pipe — **O** Disturbed sample

Plain Pipe — **Cv** Shear vane

Bentonite — **W** Water sample

Gravel Filter — **S** Standard Penetration Test

BH17

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G8214b **BH No.18 Sheet No. 1 of 1**

Location: Land at Main Road, Gainford, Darlington, DL2 3BQ **DATE:** 20/07/18

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	SPT N Value (Depth)	Depth to Water	Depth (m)
0.40	TURF and TOPSOIL. Compact dark brown slighty clayey sandy gravel. Gravel is fine to coarse and cobbles of sandstone.	400			O	Cv kN/m^2			0.25
	Dense dark orangish brown slightly clayey sandy GRAVEL / gravelly SAND. Gravel is fine to coarse of rounded sandstone. Cobbles noted.								0.50
							1.00m-1.45m 12,10,12, 12,10,10 N = 42		0.75
					O				1.00
									1.25
					O				1.50
	Becoming medium dense below 1.60m	2600							1.75
							2.00m-2.45m 5,5,6,7,6,7 N = 26		
					O				2.00
									2.25
					O				2.50
									2.75
3.00					O		3.00m-3.45m 5,6,5,5,5,6 N = 21		3.00
	Borehole Terminated at 3.00m due to refusal								

Remarks:

Casing to 1.00m

Dynamic windowless sampling by Terrier Rig to 3.00m

Borehole remained dry on completion

Borehole closed below 1.80m on completion

Key:

Slotted Pipe

Plain Pipe

Bentonite

Gravel Filter

O Disturbed sample

Cv Shear vane

W Water sample

S Standard Penetration Test

BH18

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G8214b **BH No.19 Sheet No. 1 of 1**

Location: Land at Main Road, Gainford, Darlington, DL2 3BQ **DATE**: 20/07/18

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	SPT N Value (Depth)	Depth to Water	Depth (m)
	MADE GROUND. Dense grey and orangish brown sandy gravel. Gravel is fine to coarse and cobbles of brick and sandstone. Concrete horizon from 0.40m to 0.60m	1200			O	Cv kN/m^2			0.25 0.50 0.75
1.20					O		1.00m-1.45m 7,6,6,6,6,7 N = 25		1.00
	Medium dense dark orangish brown sandy GRAVEL. Gravel is fine to coarse of sandstone.	1000			O				1.25 1.50
2.20					O		2.00m-2.45m 12,16,14, 14,14,14 N = 56		1.75 2.00 2.20
	Borehole Terminated at 2.20m due to refusal								

Remarks:

Casing to 1.00m

Dynamic windowless sampling by Terrier Rig to 2.20m

Borehole remained dry on completion

Borehole closed below 1.40m on completion

Key:

Slotted Pipe

Plain Pipe

Bentonite

Gravel Filter

O Disturbed sample

Cv Shear vane

W Water sample

S Standard Penetration Test

BH19

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G8214b **BH No.20 Sheet No. 1 of 1**

Location: Land at Main Road, Gainford, Darlington, DL2 3BQ **DATE:** 20/07/18

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	SPT N Value (Depth)	Depth to Water	Depth (m)
	MADE GROUND. Compact brown sandy gravel and cobbles. Gravel is fine to coarse of sandstone and brick with wood and occasional pot fragments also noted.	1000			O	Cv kN/m^2			0.25
					O				0.50
							1.00m-1.45m 6,6,8,10,12,13 N = 43		0.75
1.00					O				1.00
	No sample recovery. Large cobble pushed by sampler tube from 1.00m to 2.00m	1000			O				1.25
									1.50
							2.00m-2.45m 12,13,15, 19,23,48 N = 105		1.75
2.00					O				2.00
	MADE GROUND. Dense brown sandy gravel and cobbles of brick with wood fragments.	400							2.25
2.40					O				2.40
	Borehole Terminated at 2.40m due to refusal								

Remarks:

Casing to 1.00m

Dynamic windowless sampling by Terrier Rig to 2.40m

Borehole remained open and dry on completion

Key:

	Slotted Pipe	**O**	Disturbed sample
	Plain Pipe	**Cv**	Shear vane
	Bentonite	**W**	Water sample
	Gravel Filter	**S**	Standard Penetration Test

BH20

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G8214b **BH No.21 Sheet No. 1 of 1**

Location: Land at Main Road, Gainford, Darlington, DL2 3BQ **DATE:** 20/07/18

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	SPT N Value (Depth)	Depth to Water	Depth (m)
0.30	TURF / TOPSOIL. Brown gravelly sand. Gravel is fine to coarse of sandstone.	300				Cv kN/m^2			0.25
0.50	MADE GROUND. Brown mottled black gravelly sand. Gravel is fine to coarse of sandstone and slag.	200			O				0.50
1.10	Brown gravelly SAND / sandy GRAVEL. Gravel is fine to coarse with numerous cobbles of sandstone.	600			O				0.75 1.00 1.10
	Borehole terminated at 1.10m								
	Water infiltration test carried out in borehole with 1.00m casing remaining in situ. See Infiltration Test 1 results for details.								

Remarks:

Casing to 1.00m

Dynamic windowless sampling by Terrier Rig to 1.10m

Borehole remained open and dry on completion

Key:

- Slotted Pipe
- Plain Pipe
- Bentonite
- Gravel Filter

O Disturbed sample

Cv Shear vane

W Water sample

S Standard Penetration Test

BH21

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G8214b **BH No.22 Sheet No. 1 of 1**

Location: Land at Main Road, Gainford, Darlington, DL2 3BQ **DATE:** 20/07/18

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	SPT N Value (Depth)	Depth to Water	Depth (m)
0.05	CONCRETE	50				Cv kN/m^2			
0.30	MADE GROUND. Loose brown sand.	250							0.25
1.10	Brown gravelly SAND. Gravel is fine to coarse of sandstone and coal. Cobbles noted. Clayey to 0.90m.	800							0.50 0.75 1.00 1.10
	Borehole Terminated at 1.10m Water infiltration test carried out in borehole with 1.00m casing remaining in situ. See Infiltration Test 2 results for details.								

Remarks:

Casing to 1.00m

Dynamic windowless sampling by Terrier Rig to 1.10m

Borehole remained open and dry on completion

Key:

Slotted Pipe

Plain Pipe

Bentonite

Gravel Filter

O Disturbed sample

Cv Shear vane

W Water sample

S Standard Penetration Test

BH22

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G8214b **TP A** **Sheet No. 1 of 1**

Location: Land at Main Road, Gainford, Darlington, DL2 3BQ **DATE:** 20/07/18

Depth (m)	Description of Strata	Thick -ness	Legend	Sample	Test Type Result	Root Information	Depth to Water	Depth (m)
0.75	MADE GROUND. Loose dark brown and brown sandy gravel and cobbles of concrete, brick and sandstone. Some plastic also noted.	750		O				0.25 0.50 0.75
	Trial pit Terminated at 0.75m							

Remarks: Hand excavated to 0.75m
Trial pit remained stable and dry on completion

Key: **O** Disturbed sample
Cv Shear vane
W Water sample

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G8214b **TP B** **Sheet No. 1 of 1**

Location: Land at Main Road, Gainford, Darlington, DL2 3BQ **DATE:** 20/07/18

Depth (m)	Description of Strata	Thick -ness	Legend	Sample	Test Type Result	Root Information	Depth to Water	Depth (m)
0.40	TURF and TOPSOIL. Loose dark brown clayey gravelly sand. Gravel is fine to coarse of sandstone and brick.	400			Cv kN/m^2			0.25
0.60	Medium dense / firm orangish brown clayey gravelly SAND / very sandy gravelly CLAY. Gravel is fine to coarse of sandstone.	200						0.50 0.60
	Trial pit Terminated at 0.60m CBR value at 0.50m BGL = 3% (Handheld Mexeprobe test result)							

Remarks: Hand excavated to 0.60m
Trial pit remained stable and dry on completion

Key: **O** Disturbed sample
Cv Shear vane
W Water sample

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G8214b **TP C** **Sheet No.** 1 of 1

Location: Land at Main Road, Gainford, Darlington, DL2 3BQ **DATE:** 20/07/18

Depth (m)	Description of Strata	Thick -ness	Legend	Sample	Test Type Result	Root Information	Depth to Water	Depth (m)
0.30	TURF underlain by MADE GROUND. Loose dark brown and black sandy gravel and cobbles of brick, ash and sandstone. Some coal and pot also noted.	300		O	Cv kN/m^2			0.25
0.45	Firm to stiff / medium dense dark orangish brown very sandy gravelly CLAY / clayey gravelly SAND. Gravel is fine to coarse of sandstone.	150						0.45
	Trial pit Terminated at 0.45m CBR value at 0.30m BGL = 6% (Handheld Mexeprobe test result)							

Remarks: Hand excavated to 0.45m
Trial pit remained stable and dry on completion

Key: **O** Disturbed sample
Cv Shear vane
W Water sample

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G8214b **TP D** **Sheet No. 1 of 1**

Location: Land at Main Road, Gainford, Darlington, DL2 3BQ **DATE:** 20/07/18

Depth (m)	Description of Strata	Thick -ness	Legend	Sample	Test Type Result	Root Information	Depth to Water	Depth (m)
0.30	TURF underlain by MADE GROUND. Loose dark brown and black sandy gravel and cobbles of brick, ash and sandstone. Some coal and pot also noted.	300		O	Cv kN/m^2			0.25
0.50	Firm to stiff / medium dense dark orangish brown very sandy gravelly CLAY / clayey gravelly SAND. Gravel is fine to coarse of sandstone.	200						0.50
	Trial pit Terminated at 0.50m							

Remarks: Hand excavated to 0.50m
Trial pit remained stable and dry on completion

Key: **O** Disturbed sample
Cv Shear vane
W Water sample

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G8214b **TP E** **Sheet No. 1 of 1**
Location: Land at Main Road, Gainford, Darlington, DL2 3BQ **DATE:** 20/07/18

Depth (m)	Description of Strata	Thick -ness	Legend	Sample	Test Type Result	Root Information	Depth to Water	Depth (m)
0.20	MADE GROUND. Compact brown sandy gravel. Gravel is fine to coarse of brick, sandstone and ash.	200		O	Cv kN/m^2			0.25
0.40	Medium dense orangish brown sandy GRAVEL. Gravel is fine to coarse of rounded sandstone.	200						0.40
	Trial pit Terminated at 0.40m							

Remarks: Hand excavated to 0.40m
Trial pit remained stable and dry on completion

Key: **O** Disturbed sample
Cv Shear vane
W Water sample

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G8214b **TP F** **Sheet No. 1 of 1**

Location: Land at Main Road, Gainford, Darlington, DL2 3BQ **DATE:** 20/07/18

Depth (m)	Description of Strata	Thick -ness	Legend	Sample	Test Type Result	Root Information	Depth to Water	Depth (m)
0.10	TURF and TOPSOIL. Loose dark brown clayey gravelly sand. Gravel is fine to coarse of sandstone.	100			Cv kN/m^2			
0.30	Compact dark orangish brown clayey gravelly SAND / very sandy gravelly CLAY. Gravel is fine to coarse of sandstone.	200		O				0.25
	Trial pit Terminated at 0.30m CBR value at 0.30m BGL = 4.5% (Handheld Mexeprobe test result)							

Remarks: Hand excavated to 0.30m
Trial pit remained stable and dry on completion

Key: O Disturbed sample
Cv Shear vane
W Water sample

APPENDIX 2

Moisture Content and Atterberg Limit Test Results (Table 3),

Moisture Content Profiles

And

Water Infiltration Testing Results

GEOINVESTIGATE Ltd.

Atterberg Limit Test Results

Our ref. G8214b
Your ref.

Table 4
Location: Land at Main Road, Gainford, Darlington, DL2 3BQ

TP / BH No.	Sample Depth (m)	Insitu Moisture Content (%)	% Passing BS 425 Micron Sieve	Corrected Moisture Content (%)	Plastic Limit (%)	Liquid Limit (%)	Plasticity Index (%)	Soil Classification
1	0.20	2.7						
	0.50	38.5						
	1.00	28.4						
	1.50	8.0	25.1		34.4	44.5	10.1	MI
	2.00	8.5						
	2.50	15.5						
	3.00	14.9						
	3.50	15.7						
	4.00	9.5						
2	0.20	11.5						
	0.50	7.4						
	1.00	12.8						
	1.50	14.5						
	2.00	11.4						
	3.00	6.4						
	3.50	9.1						
	4.00	9.1						

GEOINVESTIGATE Ltd.

Atterberg Limit Test Results

Our ref. G8214b
Your ref.

Table 4
Location: Land at Main Road, Gainford, Darlington, DL2 3BQ

TP / BH No.	Sample Depth (m)	Insitu Moisture Content (%)	% Passing BS 425 Micron Sieve	Corrected Moisture Content (%)	Plastic Limit (%)	Liquid Limit (%)	Plasticity Index (%)	Soil Classification
3	1.00	10.2						
	1.50	3.9						
	2.00	6.3						
	2.50	6.0						
4	0.50	7.6						
	1.00	10.0						
	1.50	4.8						
	3.00	10.8						
	3.50	10.3						
	4.00	7.5						
5	0.50	4.9						
	1.00	8.5						
	2.00	14.3						
	2.50	11.4						
	3.00	15.2						
	3.50	18.6						
	4.00	14.4						

GEOINVESTIGATE Ltd.

Atterberg Limit Test Results

Our ref. G8214b
Your ref.

Table 4
Location: Land at Main Road, Gainford, Darlington, DL2 3BQ

TP / BH No.	Sample Depth (m)	Insitu Moisture Content (%)	% Passing BS 425 Micron Sieve	Corrected Moisture Content (%)	Plastic Limit (%)	Liquid Limit (%)	Plasticity Index (%)	Soil Classification
6	1.00	18.3						
	1.50	28.6						
	2.00	25.2						
	2.50	6.9						
	3.00	10.9						
	3.50	9.4						
	4.00	8.5						
7	0.20	8.9						
	0.50	10.6						
	1.00	1.0						
	1.50	9.4	16.6		32.0	51.1	19.1	MI/MH
	2.00	11.6						
	2.50	11.2						
	3.00	6.0						
	3.50	5.7						
	4.00	6.8						

GEOINVESTIGATE Ltd.

Atterberg Limit Test Results

Our ref. G8214b
Your ref.

Table 4
Location: Land at Main Road, Gainford, Darlington, DL2 3BQ

TP / BH No.	Sample Depth (m)	Insitu Moisture Content (%)	% Passing BS 425 Micron Sieve	Corrected Moisture Content (%)	Plastic Limit (%)	Liquid Limit (%)	Plasticity Index (%)	Soil Classification
8	0.20	11.5						
	0.50	3.7						
	1.00	4.7						
	1.50	8.1						
	2.00	7.5						
	2.50	7.6						
	3.00	7.2						
	3.50	7.3						
	4.00	11.8						
9	0.20	9.6						
	0.50	7.5						
	1.00	2.4						
	1.50	3.2						
10	0.20	7.3						
	0.50	18.0						
	1.00	7.7						
	1.50	10.6						
	2.00	10.6						

GEOINVESTIGATE Ltd.

Atterberg Limit Test Results

Our ref. G8214b
Your ref.

Table 4
Location: Land at Main Road, Gainford, Darlington, DL2 3BQ

TP / BH No.	Sample Depth (m)	Insitu Moisture Content (%)	% Passing BS 425 Micron Sieve	Corrected Moisture Content (%)	Plastic Limit (%)	Liquid Limit (%)	Plasticity Index (%)	Soil Classification
11	0.20	19.5						
	0.50	25.9						
	1.00	25.1						
	1.50	24.4	37.2		29.1	45.7	16.6	MI
	2.00	12.6						
	2.50	10.9						
	3.00	6.7						
	3.50	9.9						
	4.00	14.6						
12	0.20	26.9						
	0.50	20.7						
	1.00	14.2						
	1.50	14.6						
	2.00	31.5	76.1		*	*	*	*
	2.50	6.5						
	3.00	10.1						
	3.50	9.9						
	4.00	8.5						

GEOINVESTIGATE Ltd.

Atterberg Limit Test Results

Our ref. G8214b
Your ref.

Table 4
Location: Land at Main Road, Gainford, Darlington, DL2 3BQ

TP / BH No.	Sample Depth (m)	Insitu Moisture Content (%)	% Passing BS 425 Micron Sieve	Corrected Moisture Content (%)	Plastic Limit (%)	Liquid Limit (%)	Plasticity Index (%)	Soil Classification
13	0.20	13.7						
	0.50	14.1						
	1.00	17.6						
	1.50	23.5	>95		32.6	55.6	23.0	MH
	1.70	2.6						
14	0.20	12.1						
	0.50	11.1						
	1.00	23.2	>95		24.1	43.5	19.4	CI
	1.50	10.2						
	2.00	7.0						
	2.50	5.3						
	3.00	7.7						
	3.50	11.8						
	4.00	5.6						

GEOINVESTIGATE Ltd.

Atterberg Limit Test Results

Our ref. G8214b
Your ref.

Table 4
Location: Land at Main Road, Gainford, Darlington, DL2 3BQ

TP / BH No.	Sample Depth (m)	Insitu Moisture Content (%)	% Passing BS 425 Micron Sieve	Corrected Moisture Content (%)	Plastic Limit (%)	Liquid Limit (%)	Plasticity Index (%)	Soil Classification
15	0.50	10.8						
	1.00	18.1						
	1.50	22.7	>95		23.0	41.5	18.5	CI
	2.00	15.7						
	2.50	16.9						
	3.00	9.0						
	3.30	10.2						

GEOINVESTIGATE Ltd.

Atterberg Limit Test Results

Our ref. G8214b
Your ref.

Table 4
Location: Land at Main Road, Gainford, Darlington, DL2 3BQ

TP / BH No.	Sample Depth (m)	Insitu Moisture Content (%)	% Passing BS 425 Micron Sieve	Corrected Moisture Content (%)	Plastic Limit (%)	Liquid Limit (%)	Plasticity Index (%)	Soil Classification
16	0.20	9.8						
	0.50	10.0						
	0.80	10.4						
17	0.50	5.3						
	1.00	4.4						
	1.50	2.1						
	2.00	3.2						
18	1.50	6.2						
	2.00	5.8						
	2.50	4.4						
	3.00	5.3						

GEOINVESTIGATE Ltd.

Atterberg Limit Test Results

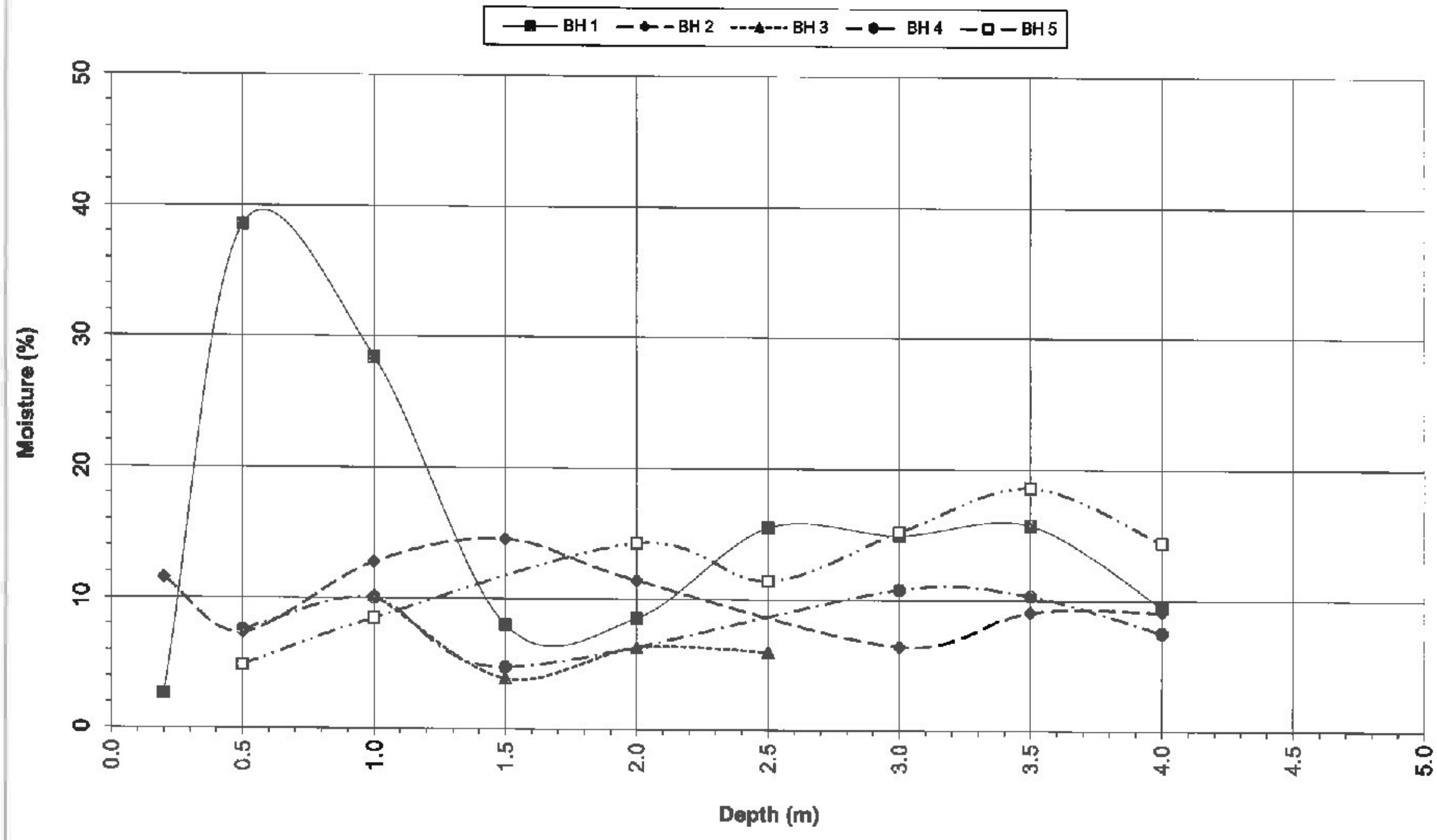
Our ref. G8214b
Your ref.

Table 4
Location: Land at Main Road, Gainford, Darlington, DL2 3BQ

TP / BH No.	Sample Depth (m)	Insitu Moisture Content (%)	% Passing BS 425 Micron Sieve	Corrected Moisture Content (%)	Plastic Limit (%)	Liquid Limit (%)	Plasticity Index (%)	Soil Classification
19	1.00	36.2						
	1.50	4.9						
	2.00	4.6						
20	0.20	7.2						
	0.50	9.7						
	1.00	12.5						
	2.00	18.5						
	2.40	53.1						

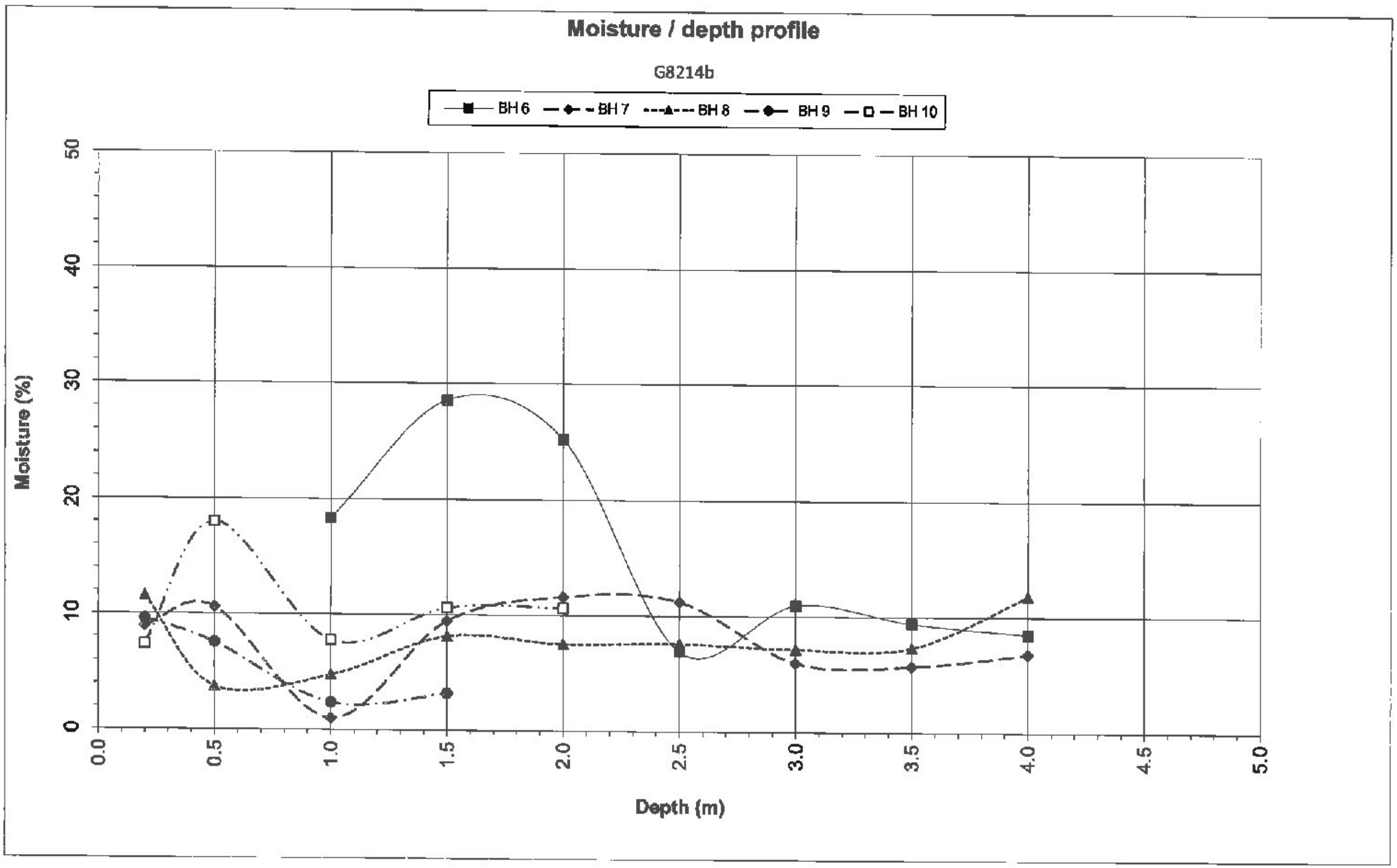
Moisture / depth profile

G8214b



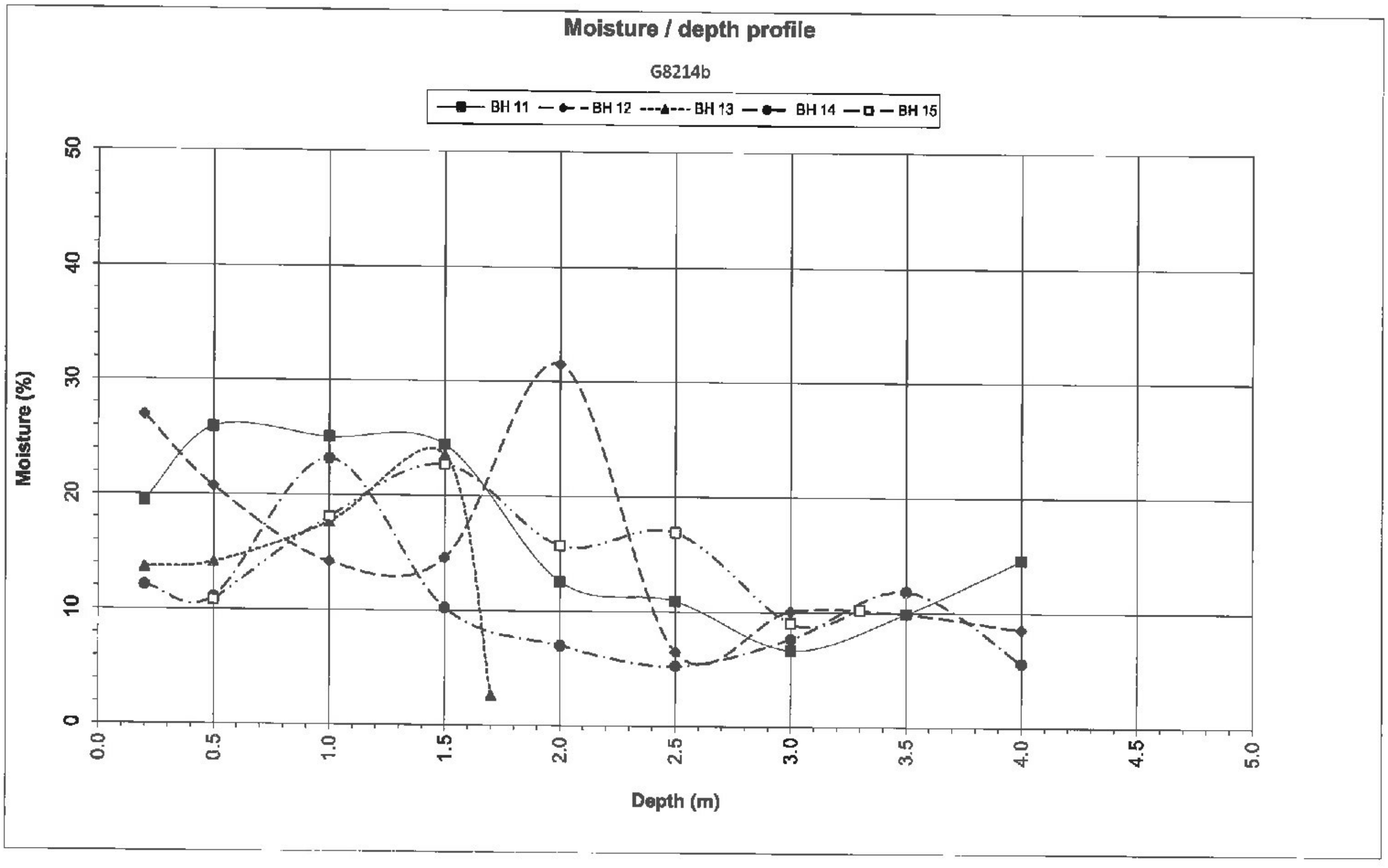
Moisture / depth profile

G8214b



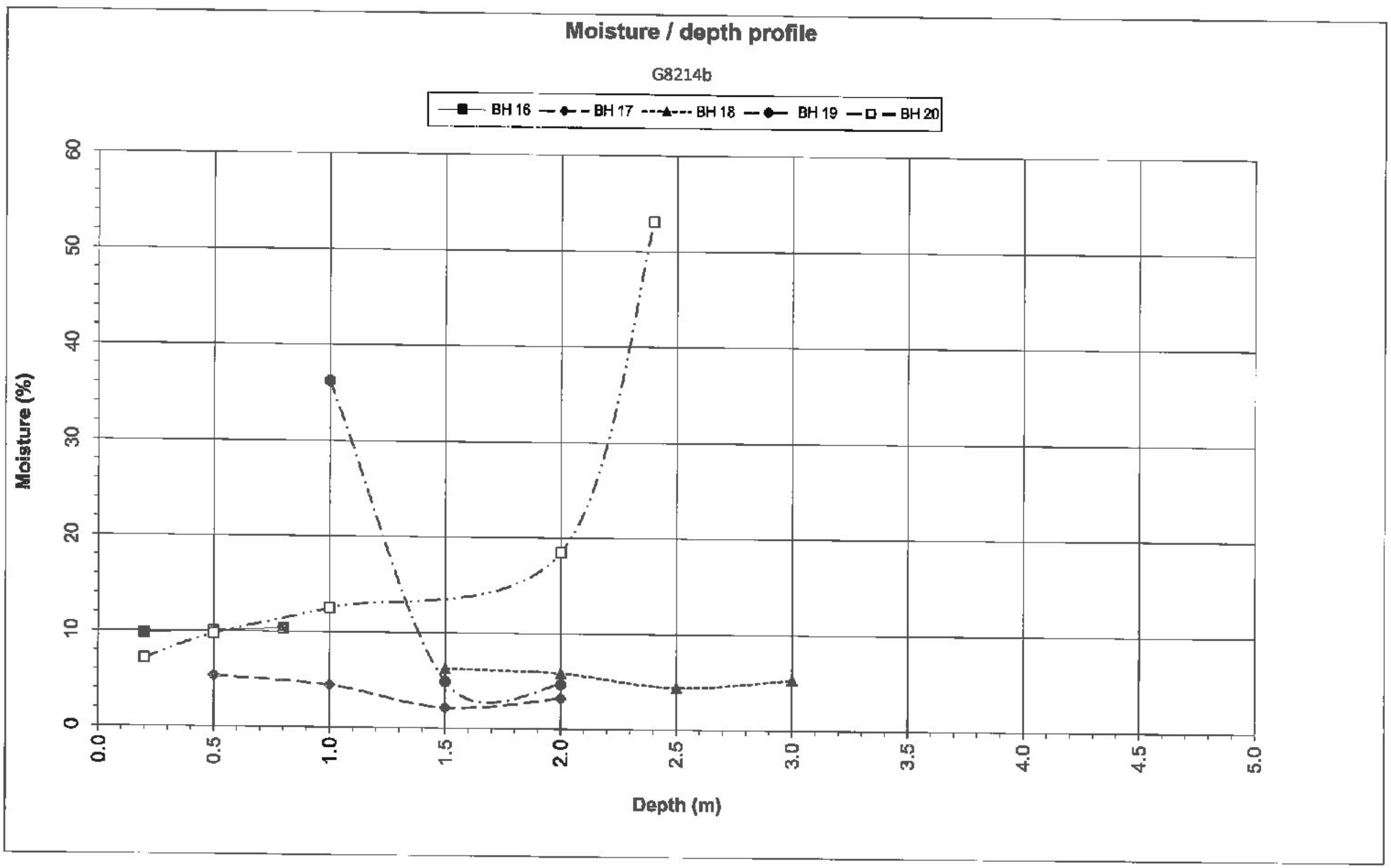
Moisture / depth profile

G8214b



Moisture / depth profile

G8214b



Infiltration Test Result

G18214

Land at Main Road, Gainford,
Darlington, DL2 3BQ
20/07/18

Infiltration test 1

(BH21)

Time/s	Depth to water/m	Head/m (above base of borehole)
0	0.000	1.100
30	0.031	1.069
60	0.063	1.037
120	0.077	1.023
180	0.093	1.007
240	0.096	1.004
300	0.104	0.996
360	0.110	0.990
420	0.110	0.990
480	0.110	0.990
600	0.110	0.990

Test abandoned after 10 minutes due to halted progress.

Borehole dimensions:

Depth of Casing, D =	1.00 m
Diameter of Casing, D =	0.125 m
Cross-sectional area, A =	0.012277 m^2
Depth below Casing, L =	0.10 m
Ground Water Level =	N/A m

Intake factor, F, using:

$$F = \frac{2\pi L}{\log_e\{(L/D) + \sqrt{[1 + (L/D)^2]}\}}$$

Source: BS 5930

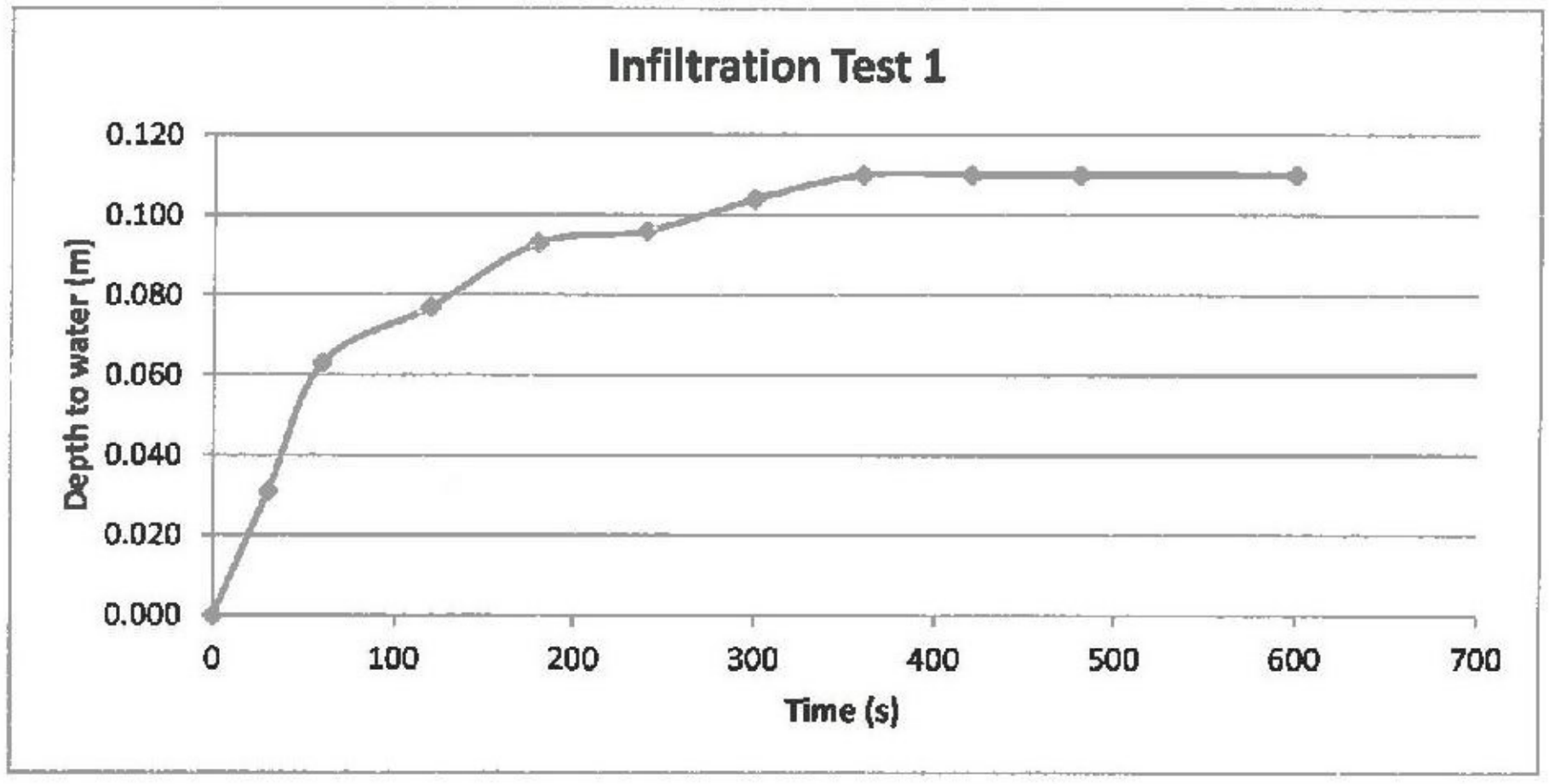
Intake factor, F =	0.858 m
Choose start time t_1 to be: t_1 =	0 s
Choose end time t_2 to be: t_2 =	360 s
Head at time t_1, H_1 =	1.1 m
Head at time t_2, H_2 =	0.99 m

Permeability, k, using:

$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2} \text{ (general approach)}$$

Source: BS 5930

Permeability, k = 4.19E-06 ms^{-1}



Infiltration Test Result

G18214

Land at Main Road, Gainford,
Darlington, DL2 3BQ
20/07/18

Infiltration test 2

(BH22)

Time/s	Depth to water/m	Head/m (if GWL present)
0	0.000	1.100
10	0.400	0.700
20	0.600	0.500
30	0.800	0.300
45	0.950	0.150
60	1.100	0.000

Test complete after 60 seconds (borehole completely drained).

Borehole dimensions:

Depth of Casing, D =	1.00 m
Diameter of Casing, D =	0.125 m
Cross-sectional area, A =	0.012277 m^2
Depth below Casing, L =	1.00 m
Ground Water Level =	N/A m

Intake factor, F, using:

$$F = \frac{2\pi L}{\log_e[(L/D) + \sqrt{1 + (L/D)^2}]}$$

Source: BS 5930

Intake factor, F = 2.264 m

Choose start time t_1 to be: t_1 = 0 s

Choose end time t_2 to be: t_2 = 60 s

Head at time t_1, H_1 = 1.1 m

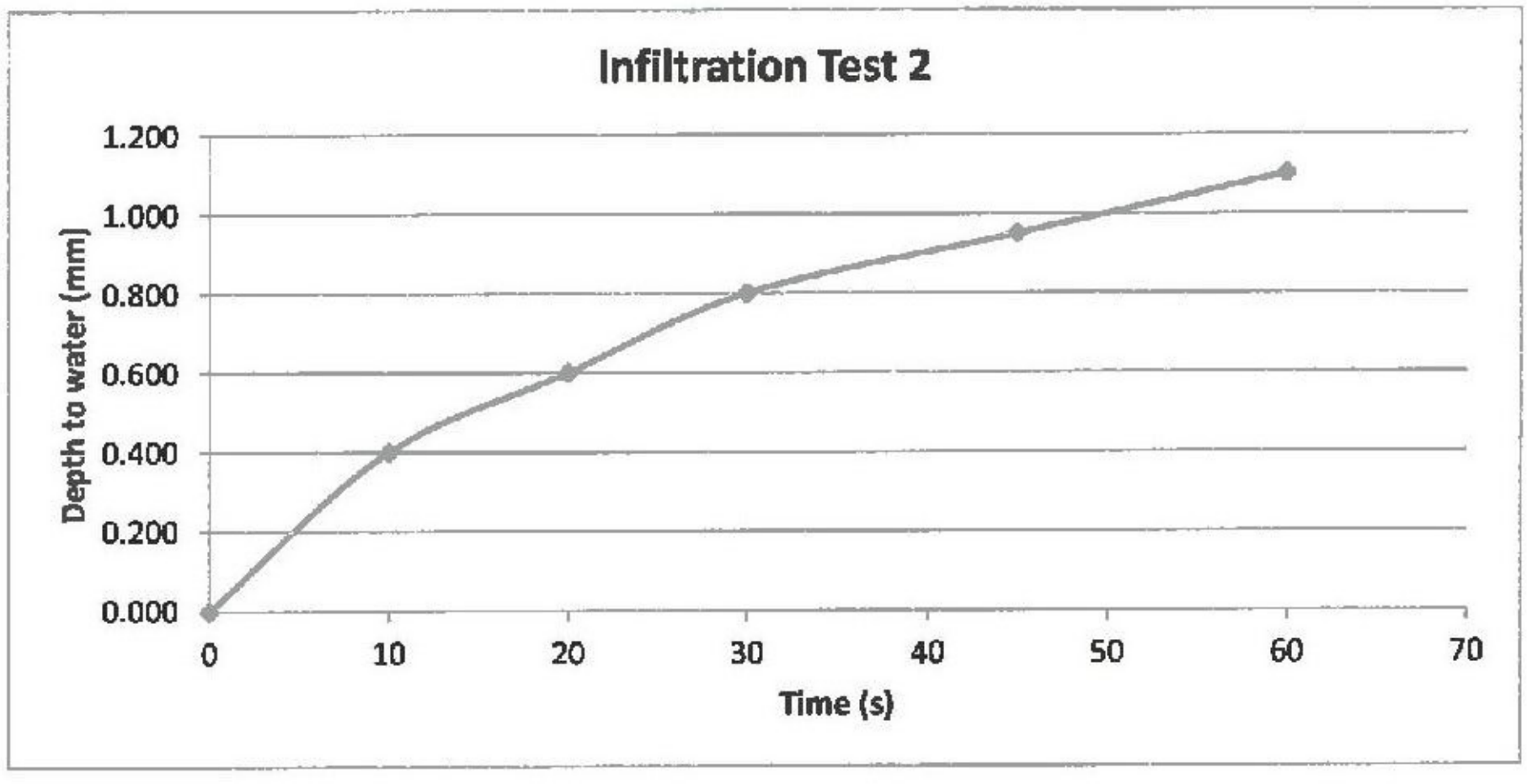
Head at time t_2, H_2 = 0.0001 m

Permeability, k, using:

$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2} \text{ (general approach)}$$

Source: BS 5930

Permeability, k = 8.41E-04 ms^{-1}



APPENDIX 3

Chemtech Analytical Test Report

2531

ANALYTICAL TEST REPORT

Contract no: 73388(1)

Contract name: Main Road, Gainford, Darlington DL2 3BQ

Client reference: G18214

Clients name: Geo Investigate

Clients address: Units 3a & 4, Terry Dicken Industrial Estate
Ellerbeck Way, Stokesley
North Yorkshire
TS9 7AE

Samples received: 01 August 2018

Analysis started: 01 August 2018

Analysis completed: 06 September 2018

Report issued: 06 September 2018

This is a supplementary report to report number 73388 issued 08 August 2018.

Notes:

Opinions and interpretations expressed herein are outside the UKAS accreditation scope.
Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.
Methods, procedures and performance data are available on request.
Results reported herein relate only to the material supplied to the laboratory.
This report shall not be reproduced except in full, without prior written approval.
Samples will be disposed of 6 weeks from initial receipt unless otherwise instructed.
BTEX compounds are identified by retention time only and may include interference from co-eluting compounds.

Key:

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

Approved by: [redacted]
Dave Bowerbank
Customer Services Co-ordinator

Chemtech Environmental Limited

SAMPLE INFORMATION

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

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

Lab ref	Sample id	Depth (m)	Sample description	Material removed	% Removed	% Moisture
73388-1	BH4	2.40	Sandy Clay with Gravel	-	-	11.2
73388-2	BH5	1.50	Clayey Sand with Gravel & Brick	-	-	5.7
73388-3	BH6	0.50	Clayey Sand with Brick & Slag	-	-	9.8
73388-4	BH8	0.50	Clayey Sand with Gravel	-	-	4.8
73388-5	BH10	0.50	Sandy Clay	-	-	10.7
73388-6	BH11	0.50	Sandy Clay with Gravel	-	-	18.6
73388-7	BH18	0.40	Sandy Clay with Gravel & Roots	-	-	8.9
73388-8	BH19	0.40	Clayey Sand with Gravel & Brick	-	-	5.6
73388-9	TPA	0.40	Clayey Sand with Gravel	-	-	5.9
73388-10	TPE	0.10	Clayey Sand with Gravel & Roots	-	-	8.2

Chemtech Environmental Limited

SOILS

Lab number			73388-1	73388-2	73388-3	73388-4	73388-5	73388-6
Sample id			BH4	BH5	BH6	BH8	BH10	BH11
Depth (m)			2.40	1.50	0.50	0.50	0.50	0.50
Date sampled			20/07/2018	20/07/2018	20/07/2018	20/07/2018	20/07/2018	20/07/2018
Test	**Method**	**Units**						
Arsenic (total)	CE127 M	mg/kg As	5.3	12	6.4	2.0	3.2	7.3
Boron (water soluble)	CE063 M	mg/kg B	1.8	1.0	0.8	0.4	0.5	0.7
Cadmium (total)	CE127 M	mg/kg Cd	0.3	0.2	0.2	<0.2	<0.2	0.4
Chromium (total)	CE127 M	mg/kg Cr	117	92	74	32	69	113
Chromium (III)	-	mg/kg CrIII	117	92	74	32	69	113
Chromium (VI)	CE146	mg/kg CrVI	<1	<1	<1	<1	<1	<1
Copper (total)	CE127 M	mg/kg Cu	18	16	43	5.3	5.9	25
Lead (total)	CE127 M	mg/kg Pb	47	73	72	13	27	133
Mercury (total)	CE127 M	mg/kg Hg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel (total)	CE127 M	mg/kg Ni	21	21	30	9.7	10	23
Selenium (total)	CE127 M	mg/kg Se	0.8	0.7	0.9	0.3	0.6	1.0
Zinc (total)	CE127 M	mg/kg Zn	99	78	120	47	79	370
pH	CE004 M	units	9.1	8.6	8.7	6.9	7.9	8.0
Sulphate (2:1 water soluble)	CE061 M	mg/l SO_4	21	136	87	<10	<10	21
Sulphide	CE079	mg/kg S^{2-}	<10	<10	<10	<10	<10	<10
Cyanide (free)	CE077	mg/kg CN	<1	<1	<1	<1	<1	<1
Cyanide (total)	CE077	mg/kg CN	<1	<1	<1	<1	<1	<1
Thiocyanate	CE145 M	mg/kg SCN	<1	<1	<1	<1	<1	<1
Phenols (total)	CE078	mg/kg PhOH	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Organic Carbon (TOC)	CE072 M	% w/w C	1.60	0.47	4.96	0.45	0.61	3.45
Estimate of OMC (calculated from TOC)	CE072 M	% w/w	2.75	0.80	8.54	0.78	1.05	5.95
PAH								
Acenaphthene	CE087 M	mg/kg	<0.01	<0.01	0.02	<0.01	<0.01	<0.01
Acenaphthylene	CE087 M	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	CE087 U	mg/kg	<0.02	<0.02	0.16	<0.02	<0.02	<0.02
Benzo(a)anthracene	CE087 U	mg/kg	<0.02	0.07	0.08	<0.02	<0.02	<0.02
Benzo(a)pyrene	CE087 U	mg/kg	<0.02	0.14	0.13	<0.02	<0.02	0.04
Benzo(b)fluoranthene	CE087 M	mg/kg	<0.02	0.17	0.16	<0.02	<0.02	0.03
Benzo(ghi)perylene	CE087 M	mg/kg	<0.02	0.07	0.07	<0.02	<0.02	<0.02
Benzo(k)fluoranthene	CE087 M	mg/kg	<0.02	0.06	0.03	<0.02	<0.02	<0.02
Chrysene	CE087 M	mg/kg	<0.01	0.10	0.18	<0.01	<0.01	<0.01
Dibenz(ah)anthracene	CE087 M	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Fluoranthene	CE087 M	mg/kg	0.05	0.24	0.22	<0.02	<0.02	0.10
Fluorene	CE087 U	mg/kg	<0.01	<0.01	0.04	<0.01	<0.01	<0.01
Indeno(123cd)pyrene	CE087 M	mg/kg	<0.02	0.06	0.03	<0.02	<0.02	<0.02
Naphthalene	CE087 M	mg/kg	<0.01	0.02	0.27	<0.01	<0.01	<0.01
Phenanthrene	CE087 M	mg/kg	<0.02	0.13	1.00	<0.02	<0.02	0.06
Pyrene	CE087 M	mg/kg	<0.02	0.17	0.19	<0.02	<0.02	0.04
PAH (total of USEPA 16)	CE087	mg/kg	<0.27	1.24	2.59	<0.27	<0.27	0.28

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SOILS

Lab number			73388-1	73388-2	73388-3	73388-4	73388-5	73388-6
Sample Id			BH4	BH5	BH6	BH8	BH10	BH11
Depth (m)			2.40	1.50	0.50	0.50	0.50	0.50
Date sampled			20/07/2018	20/07/2018	20/07/2018	20/07/2018	20/07/2018	20/07/2018
Test	**Method**	**Units**						
BTEX & TPH								
Benzene	CE057 U	mg/kg	<0.01	<0.01	<0.01	-	<0.01	<0.01
Toluene	CE057 U	mg/kg	<0.01	<0.01	<0.01	-	<0.01	<0.01
Ethylbenzene	CE057 U	mg/kg	<0.01	<0.01	<0.01	-	<0.01	<0.01
m & p-Xylene	CE057 U	mg/kg	<0.02	<0.02	<0.02	-	<0.02	<0.02
o-Xylene	CE057 U	mg/kg	<0.01	<0.01	<0.01	-	<0.01	<0.01
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	<0.01	<0.01	<0.01	-	<0.01	<0.01
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	<0.01	<0.01	<0.01	-	<0.01	<0.01
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	0.01	0.01	0.01	-	<0.01	<0.01
EPH Aromatic (>EC10-EC12)	CE068	mg/kg	<1	<1	<1	-	<1	<1
EPH Aromatic (>EC12-EC16)	CE068	mg/kg	<1	<1	<1	-	<1	<1
EPH Aromatic (>EC16-EC21)	CE068	mg/kg	<1	<1	2	-	<1	<1
EPH Aromatic (>EC21-EC35)	CE068	mg/kg	<1	<1	1	-	<1	<1
EPH Aromatic (>EC35-EC44)	CE068	mg/kg	<1	<1	<1	-	<1	<1
VPH Aliphatic (>C5-C6)	CE067	mg/kg	<0.1	<0.1	<0.1	-	<0.1	<0.1
VPH Aliphatic (>C6-C8)	CE067	mg/kg	<0.1	<0.1	<0.1	-	<0.1	<0.1
VPH Aliphatic (>C8-C10)	CE067	mg/kg	<0.1	<0.1	<0.1	-	<0.1	<0.1
EPH Aliphatic (>C10-C12)	CE068	mg/kg	<4	<4	4	-	<4	<4
EPH Aliphatic (>C12-C16)	CE068	mg/kg	<4	<4	13	-	<4	<4
EPH Aliphatic (>C16-C35)	CE068	mg/kg	<10	45	75	-	<10	32
EPH Aliphatic (>C35-C44)	CE068	mg/kg	<10	<10	<10	-	<10	29
PCB								
PCB Congener 28	CE137 M	mg/kg	-	-	-	-	-	-
PCB Congener 52	CE137 M	mg/kg	-	-	-	-	-	-
PCB Congener 101	CE137 M	mg/kg	-	-	-	-	-	-
PCB Congener 118	CE137 M	mg/kg	-	-	-	-	-	-
PCB Congener 138	CE137 M	mg/kg	-	-	-	-	-	-
PCB Congener 153	CE137 M	mg/kg	-	-	-	-	-	-
PCB Congener 180	CE137 M	mg/kg	-	-	-	-	-	-
PCB (total of ICES 7)	CE137 M	mg/kg	-	-	-	-	-	-
Subcontracted analysis								
Asbestos (qualitative)	$	-	NAD	NAD	NAD	-	-	NAD

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SOILS

Lab number			73388-7	73388-8	73388-9	73388-10
Sample id			BH18	BH19	TPA	TPE
Depth (m)			0.40	0.40	0.40	0.10
Date sampled			20/07/2018	20/07/2018	20/07/2018	20/07/2018
Test	**Method**	**Units**				
Arsenic (total)	CE127 M	mg/kg As	5.8	4.5	9.0	7.6
Boron (water soluble)	CE063 M	mg/kg B	0.4	1.9	0.8	0.8
Cadmium (total)	CE127 M	mg/kg Cd	0.3	0.5	0.6	0.5
Chromium (total)	CE127 M	mg/kg Cr	104	68	67	65
Chromium (III)	-	mg/kg CrIII	104	68	67	65
Chromium (VI)	CE146	mg/kg CrVI	<1	<1	<1	<1
Copper (total)	CE127 M	mg/kg Cu	13	12	24	36
Lead (total)	CE127 M	mg/kg Pb	38	390	391	124
Mercury (total)	CE127 M	mg/kg Hg	<0.5	<0.5	<0.5	<0.5
Nickel (total)	CE127 M	mg/kg Ni	22	12	21	29
Selenium (total)	CE127 M	mg/kg Se	1.2	0.5	1.0	1.0
Zinc (total)	CE127 M	mg/kg Zn	142	199	262	176
pH	CE004 M	units	8.1	10.3	9.0	8.2
Sulphate (2:1 water soluble)	CE061 M	mg/l SO_4	<10	154	1768	65
Sulphide	CE079	mg/kg S^{2-}	<10	<10	<10	<10
Cyanide (free)	CE077	mg/kg CN	<1	<1	<1	<1
Cyanide (total)	CE077	mg/kg CN	<1	<1	<1	<1
Thiocyanate	CE145 M	mg/kg SCN	<1	<1	<1	<1
Phenols (total)	CE078	mg/kg PhOH	<0.5	<0.5	<0.5	<0.5
Total Organic Carbon (TOC)	CE072 M	% w/w C	0.27	0.52	3.64	4.37
Estimate of OMC (calculated from TOC)	CE072 M	% w/w	0.47	0.90	6.28	7.54
PAH						
Acenaphthene	CE087 M	mg/kg	<0.01	<0.01	0.25	0.02
Acenaphthylene	CE087 M	mg/kg	<0.01	<0.01	<0.01	<0.01
Anthracene	CE087 U	mg/kg	<0.02	<0.02	0.45	0.12
Benzo(a)anthracene	CE087 U	mg/kg	<0.02	0.09	0.72	0.42
Benzo(a)pyrene	CE087 U	mg/kg	<0.02	0.13	0.67	0.49
Benzo(b)fluoranthene	CE087 M	mg/kg	<0.02	0.11	0.81	0.60
Benzo(ghi)perylene	CE087 M	mg/kg	<0.02	0.05	0.36	0.26
Benzo(k)fluoranthene	CE087 M	mg/kg	<0.02	0.05	0.36	0.25
Chrysene	CE087 M	mg/kg	<0.01	0.08	0.74	0.54
Dibenz(ah)anthracene	CE087 M	mg/kg	<0.02	<0.02	0.06	0.05
Fluoranthene	CE087 M	mg/kg	<0.02	0.25	1.92	0.86
Fluorene	CE087 U	mg/kg	<0.01	<0.01	0.17	0.02
Indeno(123cd)pyrene	CE087 M	mg/kg	<0.02	0.04	0.39	0.26
Naphthalene	CE087 M	mg/kg	<0.01	0.03	0.07	0.08
Phenanthrene	CE087 M	mg/kg	<0.02	0.13	1.68	0.57
Pyrene	CE087 M	mg/kg	<0.02	0.18	1.44	0.72
PAH (total of USEPA 16)	CE087	mg/kg	<0.27	1.14	10.1	5.27

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SOILS

Lab number			73388-7	73388-8	73388-9	73388-10
Sample id			BH18	BH19	TPA	TPE
Depth (m)			0.40	0.40	0.40	0.10
Date sampled			20/07/2018	20/07/2018	20/07/2018	20/07/2018
Test	**Method**	**Units**				
BTEX & TPH						
Benzene	CE057 U	mg/kg	<0.01	-	-	<0.01
Toluene	CE057 U	mg/kg	<0.01	-	-	<0.01
Ethylbenzene	CE057 U	mg/kg	<0.01	-	-	<0.01
m & p-Xylene	CE057 U	mg/kg	<0.02	-	-	<0.02
o-Xylene	CE057 U	mg/kg	<0.01	-	-	<0.01
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	<0.01	-	-	<0.01
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	<0.01	-	-	<0.01
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	<0.01	-	-	<0.01
EPH Aromatic (>EC10-EC12)	CE068	mg/kg	<1	-	-	<1
EPH Aromatic (>EC12-EC16)	CE068	mg/kg	<1	-	-	<1
EPH Aromatic (>EC16-EC21)	CE068	mg/kg	<1	-	-	2
EPH Aromatic (>EC21-EC35)	CE068	mg/kg	<1	-	-	3
EPH Aromatic (>EC35-EC44)	CE068	mg/kg	<1	-	-	<1
VPH Aliphatic (>C5-C6)	CE067	mg/kg	<0.1	-	-	<0.1
VPH Aliphatic (>C6-C8)	CE067	mg/kg	<0.1	-	-	<0.1
VPH Aliphatic (>C8-C10)	CE067	mg/kg	<0.1	-	-	<0.1
EPH Aliphatic (>C10-C12)	CE068	mg/kg	<4	-	-	<4
EPH Aliphatic (>C12-C16)	CE068	mg/kg	<4	-	-	5
EPH Aliphatic (>C16-C35)	CE068	mg/kg	16	-	-	117
EPH Aliphatic (>C35-C44)	CE068	mg/kg	<10	-	-	<10
PCB						
PCB Congener 28	CE137 H	mg/kg	-	<0.004	-	-
PCB Congener 52	CE137 H	mg/kg	-	<0.004	-	-
PCB Congener 101	CE137 H	mg/kg	-	<0.008	-	-
PCB Congener 118	CE137 H	mg/kg	-	<0.006	-	-
PCB Congener 138	CE137 H	mg/kg	-	<0.006	-	-
PCB Congener 153	CE137 H	mg/kg	-	<0.009	-	-
PCB Congener 180	CE137 H	mg/kg	-	<0.008	-	-
PCB (total of ICES 7)	CE137 H	mg/kg	-	<0.045	-	-
Subcontracted analysis						
Asbestos (qualitative)	$	-	-	-	Chrysotile	NAD

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PREPARED LEACHATES

Lab number Sample Id Depth (m)			73388-2L BH5 1.50	73388-5L BH10 0.50	73388-10L TPE 0.10
Test	**Method**	**Units**			
Arsenic (dissolved)	CE128 U	µg/l As	5.81	0.40	1.63
Boron (dissolved)	CE128 U	µg/l B	19	20	13
Cadmium (dissolved)	CE128 U	µg/l Cd	<0.07	0.11	<0.07
Chromium (dissolved)	CE128 U	µg/l Cr	<0.2	0.3	<0.2
Copper (dissolved)	CE128 U	µg/l Cu	3.5	9.6	6.1
Lead (dissolved)	CE128 U	µg/l Pb	1.2	14.9	1.9
Mercury (dissolved)	CE128 U	µg/l Hg	<0.008	<0.008	<0.008
Nickel (dissolved)	CE128 U	µg/l Ni	<0.5	1.9	0.9
Selenium (dissolved)	CE128 U	µg/l Se	0.74	0.26	0.47
Zinc (dissolved)	CE128 U	µg/l Zn	2	22	6
pH	CE004 U	units	8.7	7.9	8.2
Sulphate	CE049 U	mg/l SO_4	<10	<10	<10
Sulphur (dissolved)	CE128 U	mg/l S	0.5	0.3	0.5
Sulphide	CE079	µg/l S^{2-}	<100	<100	<100
Cyanide (free)	CE147	µg/l CN	<10	<10	<10
Cyanide (total)	CE147	µg/l CN	<10	<10	<10
Thiocyanate	CE014	µg/l SCN	<200	<200	<200
Phenols (total)	CE148	µg/l PhOH	<10	<10	<10
PAH					
Acenaphthene	CE051	µg/l	<0.1	<0.1	<0.1
Acenaphthylene	CE051	µg/l	<0.1	<0.1	<0.1
Anthracene	CE051	µg/l	<0.1	<0.1	<0.1
Benzo(a)anthracene	CE051	µg/l	<0.1	<0.1	<0.1
Benzo(a)pyrene	CE051	µg/l	<0.1	<0.1	<0.1
Benzo(b)fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1
Benzo(ghi)perylene	CE051	µg/l	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1
Chrysene	CE051	µg/l	<0.1	<0.1	<0.1
Dibenz(ah)anthracene	CE051	µg/l	<0.1	<0.1	<0.1
Fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1
Fluorene	CE051	µg/l	<0.1	<0.1	<0.1
Indeno(123cd)pyrene	CE051	µg/l	<0.1	<0.1	<0.1
Naphthalene	CE051	µg/l	<0.1	<0.1	<0.1
Phenanthrene	CE051	µg/l	<0.1	<0.1	<0.1
Pyrene	CE051	µg/l	<0.1	<0.1	<0.1
PAH (total of USEPA 16)	CE051	µg/l	<1.6	<1.6	<1.6
TPH					
VPH Aromatic (>EC5-EC7)	CE067	µg/l	<1	<1	<1
VPH Aromatic (>EC7-EC8)	CE067	µg/l	<1	<1	<1
VPH Aromatic (>EC8-EC10)	CE067	µg/l	<1	<1	<1
EPH Aromatic (>EC10-EC12)	CE161	µg/l	<1	<1	<1
EPH Aromatic (>EC12-EC16)	CE161	µg/l	<1	<1	<1

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PREPARED LEACHATES

Lab number			73388-2L	73388-5L	73388-10L
Sample Id			BH5	BH10	TPE
Depth (m)			1.50	0.50	0.10
Test	**Method**	**Units**			
EPH Aromatic (>EC16-EC21)	CE161	µg/l	<1	<1	<1
EPH Aromatic (>EC21-EC35)	CE161	µg/l	<1	<1	<1
EPH Aromatic (>EC35-EC44)	CE161	µg/l	<1	<1	<1
VPH Aliphatic (>C5-C6)	CE067	µg/l	<1	<1	<1
VPH Aliphatic (>C6-C8)	CE067	µg/l	<1	<1	<1
VPH Aliphatic (>C8-C10)	CE067	µg/l	<1	<1	<1
EPH Aliphatic (>C10-C12)	CE161	µg/l	<1	<1	<1
EPH Aliphetic (>C12-C16)	CE161	µg/l	<1	<1	<1
EPH Aliphatic (>C16-C35)	CE161	µg/l	<1	<1	<1
EPH Aliphatic (>C35-C44)	CE161	µg/l	<1	<1	<1

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE127	Arsenic (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg As
CE063	Boron (water soluble)	Hot water extract, ICP-OES	Dry	M	0.5	mg/kg B
CE127	Cadmium (total)	Aqua regia digest, ICP-MS	Dry	M	0.2	mg/kg Cd
CE127	Chromium (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cr
-	Chromium (III)	Calculation: Cr (total) - Cr (VI)	Dry		1	mg/kg CrIII
CE146	Chromium (VI)	Acid extraction, Colorimetry	Dry		1	mg/kg CrVI
CE127	Copper (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cu
CE127	Lead (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Pb
CE127	Mercury (total)	Aqua regia digest, ICP-MS	Dry	M	0.5	mg/kg Hg
CE127	Nickel (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Ni
CE127	Selenium (total)	Aqua regia digest, ICP-MS	Dry	M	0.3	mg/kg Se
CE127	Zinc (total)	Aqua regia digest, ICP-MS	Dry	M	5	mg/kg Zn
CE004	pH	Based on BS 1377, pH Meter	Wet	M	-	units
CE061	Sulphate (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry	M	10	mg/l SO_4
CE079	Sulphide	Extraction, Continuous Flow Colorimetry	Wet		10	mg/kg S^{2-}
CE077	Cyanide (free)	Extraction, Continuous Flow Colorimetry	Wet		1	mg/kg CN
CE077	Cyanide (total)	Extraction, Continuous Flow Colorimetry	Wet		1	mg/kg CN
CE145	Thiocyanate	Weak acid extraction, Colorimetry	Dry	M	1	mg/kg SCN
CE078	Phenols (total)	Extraction, Continuous Flow Colorimetry	Wet		0.5	mg/kg PhOH
CE072	Total Organic Carbon (TOC)	Removal of IC by acidification, Carbon Analyser	Dry	M	0.1	% w/w C
CE072	Estimate of OMC (calculated from TOC)	Calculation from Total Organic Carbon	Dry	M	0.1	% w/w
CE087	Acenaphthene	Solvent extraction, GC-MS	Wet	M	0.01	mg/kg
CE087	Acenaphthylene	Solvent extraction, GC-MS	Wet	M	0.01	mg/kg
CE087	Anthracene	Solvent extraction, GC-MS	Wet	U	0.02	mg/kg
CE087	Benzo(a)anthracene	Solvent extraction, GC-MS	Wet	U	0.02	mg/kg
CE087	Benzo(a)pyrene	Solvent extraction, GC-MS	Wet	U	0.02	mg/kg
CE087	Benzo(b)fluoranthene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Benzo(ghi)perylene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Benzo(k)fluoranthene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Chrysene	Solvent extraction, GC-MS	Wet	M	0.01	mg/kg
CE087	Dibenz(ah)anthracene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Fluoranthene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Fluorene	Solvent extraction, GC-MS	Wet	U	0.01	mg/kg
CE087	Indeno(123cd)pyrene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Naphthalene	Solvent extraction, GC-MS	Wet	M	0.01	mg/kg
CE087	Phenanthrene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Pyrene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	PAH (total of USEPA 16)	Solvent extraction, GC-MS	Wet		0.27	mg/kg
CE057	Benzene	Headspace GC-FID	Wet	U	0.01	mg/kg
CE057	Toluene	Headspace GC-FID	Wet	U	0.01	mg/kg
CE057	Ethylbenzene	Headspace GC-FID	Wet	U	0.01	mg/kg
CE057	m & p-Xylene	Headspace GC-FID	Wet	U	0.02	mg/kg
CE057	o-Xylene	Headspace GC-FID	Wet	U	0.01	mg/kg
CE067	VPH Aromatic (>EC5-EC7)	Headspace GC-FID	Wet		0.01	mg/kg

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE067	VPH Aromatic (>EC7-EC8)	Headspace GC-FID	Wet		0.01	mg/kg
CE067	VPH Aromatic (>EC8-EC10)	Headspace GC-FID	Wet		0.01	mg/kg
CE068	EPH Aromatic (>EC10-EC12)	Solvent extraction, GC-FID	Wet		1	mg/kg
CE068	EPH Aromatic (>EC12-EC16)	Solvent extraction, GC-FID	Wet		1	mg/kg
CE068	EPH Aromatic (>EC16-EC21)	Solvent extraction, GC-FID	Wet		1	mg/kg
CE068	EPH Aromatic (>EC21-EC35)	Solvent extraction, GC-FID	Wet		1	mg/kg
CE068	EPH Aromatic (>EC35-EC44)	Solvent extraction, GC-FID	Wet		1	mg/kg
CE067	VPH Aliphatic (>C5-C6)	Headspace GC-FID	Wet		0.1	mg/kg
CE067	VPH Aliphatic (>C6-C8)	Headspace GC-FID	Wet		0.1	mg/kg
CE067	VPH Aliphatic (>C8-C10)	Headspace GC-FID	Wet		0.1	mg/kg
CE068	EPH Aliphatic (>C10-C12)	Solvent extraction, GC-FID	Wet		4	mg/kg
CE068	EPH Aliphatic (>C12-C16)	Solvent extraction, GC-FID	Wet		4	mg/kg
CE068	EPH Aliphatic (>C16-C35)	Solvent extraction, GC-FID	Wet		4	mg/kg
CE068	EPH Aliphatic (>C35-C44)	Solvent extraction, GC-FID	Wet		10	mg/kg
CE137	PCB Congener 28	Solvent extraction, GC-MS	Wet	M	0.004	mg/kg
CE137	PCB Congener 52	Solvent extraction, GC-MS	Wet	M	0.004	mg/kg
CE137	PCB Congener 101	Solvent extraction, GC-MS	Wet	M	0.008	mg/kg
CE137	PCB Congener 118	Solvent extraction, GC-MS	Wet	M	0.006	mg/kg
CE137	PCB Congener 138	Solvent extraction, GC-MS	Wet	M	0.006	mg/kg
CE137	PCB Congener 153	Solvent extraction, GC-MS	Wet	M	0.009	mg/kg
CE137	PCB Congener 180	Solvent extraction, GC-MS	Wet	M	0.008	mg/kg
CE137	PCB (total of ICES 7)	Solvent extraction, GC-MS	Wet	M	0.045	mg/kg
$	Asbestos (qualitative)	HSG 248, Microscopy	Dry	U	-	-

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METHOD DETAILS

METHOD	PREPARED LEACHATES	METHOD SUMMARY	STATUS	LOD	UNITS
CE001	Leachate preparation (EA)	L:S 10:1		-	-
CE128	Arsenic (dissolved)	ICP-MS	U	0.06	µg/l As
CE128	Boron (dissolved)	ICP-MS	U	6	µg/l B
CE128	Cadmium (dissolved)	ICP-MS	U	0.07	µg/l Cd
CE128	Chromium (dissolved)	ICP-MS	U	0.2	µg/l Cr
CE128	Copper (dissolved)	ICP-MS	U	0.4	µg/l Cu
CE128	Lead (dissolved)	ICP-MS	U	0.2	µg/l Pb
CE128	Mercury (dissolved)	ICP-MS	U	0.008	µg/l Hg
CE128	Nickel (dissolved)	ICP-MS	U	0.5	µg/l Ni
CE128	Selenium (dissolved)	ICP-MS	U	0.07	µg/l Se
CE128	Zinc (dissolved)	ICP-MS	U	1	µg/l Zn
CE004	pH	Based on BS 1377, pH Meter	U	-	units
CE049	Sulphate	Ion Chromatography	U	10	mg/l SO_4
CE128	Sulphur (dissolved)	ICP-MS	U	0.2	mg/l S
CE079	Sulphide	Continuous Flow Colorimetry		100	µg/l S2-
CE147	Cyanide (free)	Distillation, Colorimetry		20	µg/l CN
CE147	Cyanide (total)	Continuous Flow Colorimetry		20	µg/l CN
CE014	Thiocyanate	Colorimetry		200	µg/l SCN
CE148	Phenols (total)	Continuous Flow Colorimetry		10	µg/l PhOH
CE051	PAH (speciated)	Solvent extraction, GC-MS		0.1	µg/l
CE051	PAH (total of USEPA 16)	Solvent extraction, GC-MS		1.6	µg/l
CE067	VPH Aromatic (>EC5-EC7)	Headspace GC-FID		1	µg/l
CE067	VPH Aromatic (>EC7-EC8)	Headspace GC-FID		1	µg/l
CE067	VPH Aromatic (>EC8-EC10)	Headspace GC-FID		1	µg/l
CE161	EPH Aromatic (>EC10-EC12)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aromatic (>EC12-EC16)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aromatic (>EC16-EC21)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aromatic (>EC21-EC35)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aromatic (>EC35-EC44)	Solvent extraction, GC-FID		1	µg/l
CE067	VPH Aliphatic (>C5-C6)	Headspace GC-FID		1	µg/l
CE067	VPH Aliphatic (>C6-C8)	Headspace GC-FID		1	µg/l
CE067	VPH Aliphatic (>C8-C10)	Headspace GC-FID		1	µg/l
CE161	EPH Aliphatic (>C10-C12)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aliphatic (>C12-C16)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aliphatic (>C16-C35)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aliphatic (>C35-C44)	Solvent extraction, GC-FID		1	µg/l

Chemtech Environmental Limited

DEVIATING SAMPLE INFORMATION

Comments
Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.
For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.
Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

Key

N	No (not deviating sample)
Y	Yes (deviating sample)
NSD	Sampling date not provided
NST	Sampling time not provided (waters only)
EHT	Sample exceeded holding time(s)
IC	Sample not received in appropriate containers
HP	Headspace present in sample container
NCF	Sample not chemically fixed (where appropriate)
OR	Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
73388-1	BH4	2.40	N	
73388-2	BH5	1.50	N	
73388-3	BH6	0.50	N	
73388-4	BH8	0.50	N	
73388-5	BH10	0.50	N	
73388-6	BH11	0.50	N	
73388-7	BH18	0.40	N	
73388-8	BH19	0.40	N	
73388-9	TPA	0.40	N	
73388-10	TPE	0.10	N	