

WE ARE SYMMETRYS

DRAINAGE DESIGN VALIDATION REPORT

DOWNLANDS PARK
BOLNORE FARM LANE
HAYWARDS HEATH
RH16 4BQ

21279-SYM-XX-XX-RP-C-0100



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REVISION HISTORY

Revision	Description	Date	By	Checked
A	First Issue	31/10/2024	CE	AH

1.0 Executive Summary

- 1.1 This report outlines an updated surface water drainage strategy for the Downlands Park site, reflecting recent findings from extensive ground investigations, and in an attempt to progress a drainage strategy that does not rely on the use of deep bore soakaways due to their ineffectiveness as surface water discharge methods in other local developments.
- 1.2 This report references the previous and current planning references DM/20/4159 and DM/23/3195 respectively.
- 1.3 Due to low infiltration rates observed across most of the site, the initial site-wide infiltration design has been revised. A sand band identified running from north to south/southeast offers improved infiltration conditions, prompting the replacement of multiple site-wide infiltration structures with a single, strategically positioned infiltration basin in the southern area of the site.
- 1.4 Evidence from neighbouring developments, which successfully use infiltration within similar shallow sand bands, supports the feasibility of the proposed strategy for Downlands Park.
- 1.5 Initial infiltration testing has provided foundational data; however, additional tests will be conducted to confirm infiltration rates and ensure full compliance.
- 1.6 This report provides technical justification for the proposed drainage strategy and outlines next steps to confirm the viability of the infiltration basin within the current design.

2.0 Introduction

- 2.1 This report evaluates the feasibility of a revised surface water drainage strategy based on updated site investigation data. The original approach, utilising distributed infiltration structures, proved infeasible due to poor infiltration rates across much of the site. Revised plans now focus on a targeted, localised infiltration basin over a sand-rich area in the north, which offers better infiltration rates.
- 2.2 The purpose of this report is to present a viable surface water management solution that aligns with the planning condition, demonstrating that infiltration can be achieved effectively without resorting to deep bore soakaways. This solution is consistent with findings from nearby sites and provides a more reliable, sustainable approach based on current ground conditions.
- 2.3 Original scheme submitted for planning proposed use of several infiltration structures around the site.
- 2.4 Further site and ground investigation surveys have revealed that infiltration is not feasible in many of the suggested locations.
- 2.5 On-site trial pits and infiltration testing suggests an area of sand that bands through the site, from north to south towards the east. This is further supported by the new development to the north which discharges surface water via infiltration structures, again towards the east.
- 2.6 Therefore, the below ground surface water drainage strategy has changed to suit the now known ground conditions.
- 2.7 This has resulted in utilising the probable sand band that runs through the site, by moving from site wide infiltration to a localised infiltration approach using an infiltration basin.

3.0 Site Investigation Findings

- 3.1 This section summarises the findings of multiple site investigations, which revealed variable ground conditions affecting infiltration capacity. Three site investigations were conducted in 2016, 2022, and 2024, each contributing data to help establish the surface water drainage strategy.

3.2 Southern Testing – Borehole and Soakage Report – January 2016

- 3.2.1 Southern Testing carried out on-site testing and issued the findings within the Borehole and Soakage Report for Downlands Park, Haywards Heath, West Sussex report ref J12448.
- 3.2.2 Refer to Appendix A for the full report.

Site investigation included:

- 4no. boreholes drilled to 10m (BH1-BH4).
- 5no trial pit soakage tests (TP201-TP205).
- Additional trial pit (TP206).

- 3.2.3 It should be noted that the report was not a fully comprehensive investigation report and was to an engineering design document. However, it does give details of soil conditions and infiltration rates within the site.

- 3.2.4 Summary of soils encountered from exploratory holes can be seen within Table 1.

Table 1: Summary of Soils – Southern Testing

Depth (m)	Soil Type	Description
GL – 0.2/0.5	TOPSOIL/ MADE GROUND	Brown, silty/sandy CLAY, with occasional flint gravel and brick fragments.
2.0 – 10.5	VARIABLE	Firm to stiff, orange/yellow brown, silty/sandy CLAY, with variable bands/fragments of weak siltstone, sandstone and mudstone.

- 3.2.5 Summary of the 5no. soakage test results can be seen in Table 2 below. Note that BRE Digest 365 was followed for testing purposes.

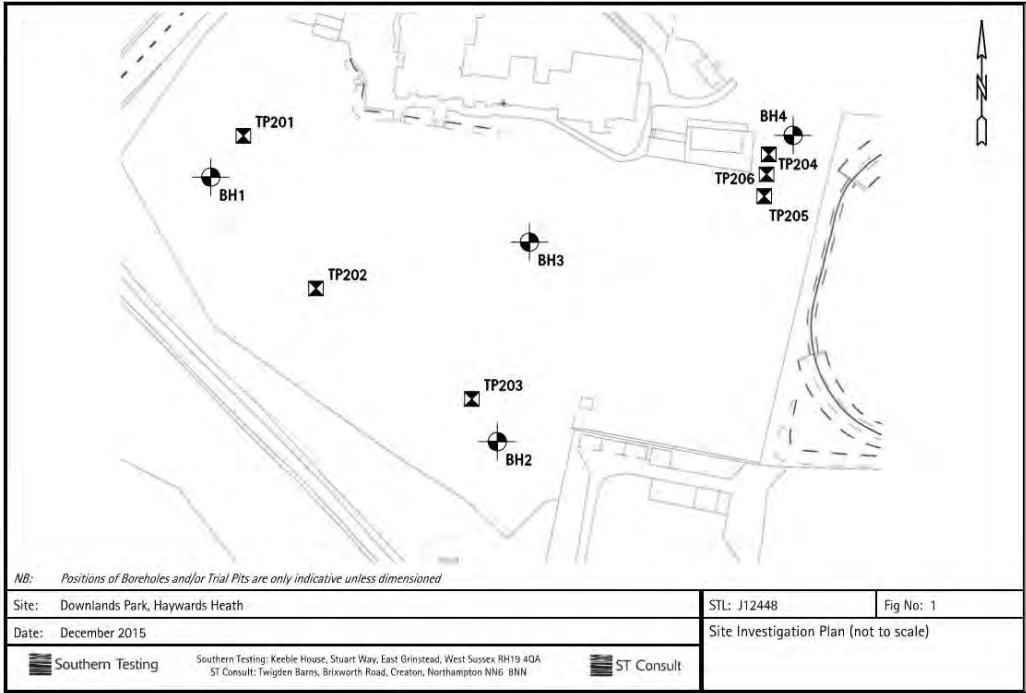
Table 2: Summary of Infiltration Tests – Southern Testing

TP Ref	Depth (m)	f (l/m²/min)	BRE Units (m/sec)	Comments
TP201	3	0	N/A	No water level fall in 240 mins
TP202	3	0.005	7.6x10 ⁻⁶	Water level fell only 0.02m in 240 min
TP203	3	N/A	N/A	Water level rose 0.01m over the course of the test due to near surface seepages
TP204	2	0.04	6.9x10 ⁻⁷	Water level fell only 0.08m in 240 mins
TP205	2.5	0.02	2.8x10 ⁻⁷	Water level fell only 0.09m in 240 mins

- 3.2.6 Table 2 indicates poor infiltration rates encountered at the test depths.

- 3.2.7 Figure 1 below shows the locations of the BHs and TPs in relation to the site.

Figure 1: Site Investigation Plan – Southern Testing



Source: Southern Testing, Borehole and Soakage Report, J12448

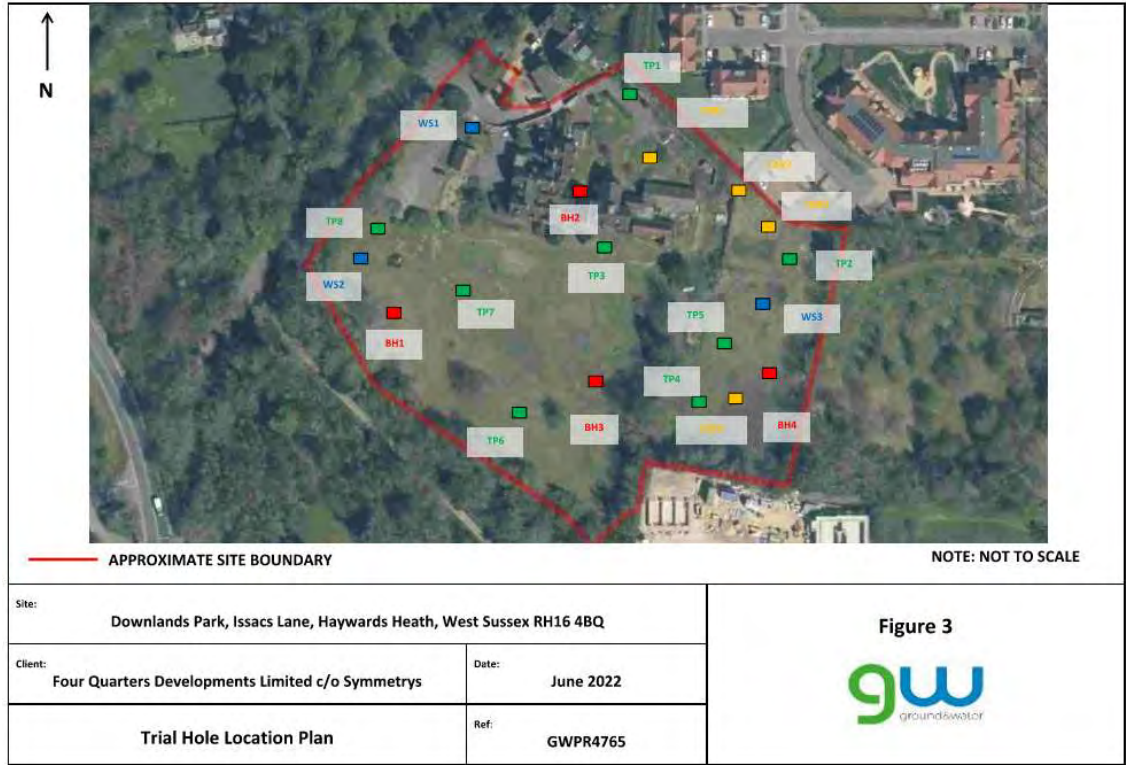
- 3.2.8 It's understood the indicated locations of the TPs and BHs are indicative only, however it's assumed they're accurate within a certain tolerance and therefore sufficient for the purpose of this report.
- 3.2.9 The sand band is estimated to be between BH3 and TP206, travelling north to south.
- 3.2.10 The current location of the proposed basin is within the area of BH2 and TP203. BH2 indicates clay to a depth of 2.8m where the strata changes to sandstone from 2.8m to 3.6m. Clay is encountered again at 3.6m to 4.5m, with sandstone found at 5.4m to 6.8m.
- 3.2.11 TP203 soakage test result was deemed N/A due to water level rising during test. From review of BH2, it's envisaged that the clay layer at 3.6m BGL was resulting in perched ground water and thus the soakage test at 3m BGL failed.
- 3.3 Ground&Water – Phase II Site Investigation Report – June 2022
- 3.3.1 Ground&Water carried out on-site testing and issued the findings within the Phase II Site Investigation Report, June 2022, report ref GWPR4765/SIR/June 2022.
- 3.3.2 Refer to Appendix B for the full report.
- 3.3.3 Site investigation included (From Phase I, II and III):
 - 4no. boreholes drilled to a depth between 15m (BH1, BH2 and BH4) and 25m (BH3).
 - 3no. windowless sampler to a depth between 1.5m and 3.0m (WS1 – WS3).
 - 7no trial pits to a depth between 1.35m and 2.3m (TP1 – TP7).
- 3.3.4 Summary of soils encountered from exploratory holes can be seen within Table 3.

Table 3: Summary of Soils – Ground&Water

Depth (m)	Soil Type	Description
0.2 – 0.45	TOPSOIL (BH1 – BH4, WS2 – WS3, TP1 – TP8)	Pale brown slightly gravelly fine SAND to brown sandy CLAY. The gravel was sub-angular to sub-rounded, fine to medium sandstone.
0.3 – 0.7	MADE GROUND (WS1, TP2)	Brown gravelly clayey fine to medium SAND to sandy CLAY. The gravel was sub-angular to sub-rounded, fine to coarse sandstone, flint and brick.
0.2 – 0.95	MADE GROUND (TP6 only)	Brown clayey GRAVEL. The gravel was sub-angular, fine to coarse brick and concrete.
0.2/0.95 – 1.2/4.6	UPPER TUNBRIDGE WELLS SAND FORMATION	Variable deposits ranging from a pale grey and orange brown mottled silty CLAY with pockets of orange silt to orange slightly gravelly to gravelly SAND. The sand was fine to medium and the gravel sub-angular, fine to medium flint. brown to grey slightly gravelly CLAY. Gravel is sub-angular to sub-rounded, fine to medium flint.
3.5/4.1 – 15/25	UPPER TUNBRIDGE WELLS SAND FORMATION (BH1 – BH4 only)	Interbedded pale grey and pale orange SANDSTONE, SILTSTONE and occasional dark grey MUDSTONE

- 3.3.10 Note that soakage tests were beyond the scope of this investigation.
- 3.3.11 Groundwater was not encountered in the boreholes and trial pits.
- 3.3.12 Figure 2 below shows the locations of the exploratory holes referenced.

Figure 2: Site Investigation Plan – Ground&Water



Source: Ground&Water, Phase II Site Investigation Report, GWPR4765/SIR/June 2022

3.3.13 The sand band is estimated along the length of TP4 and TP5. Results from the exploratory hole indicate shallow sand within these areas, further supporting the theory.

3.4 LMB Geosolutions Ltd – Soakage Tests – August 2024

3.4.1 LMB Geosolutions Ltd carried out on-site testing and issued the findings within the Infiltration Soakaway Testing Report, August 2024, report ref LMB_24.08.20_PILLET_Downlands Park_Soakaways_v1.0_ALL.

3.4.2 Refer to Appendix C for the full report.

3.4.3 Site investigation included:

- 8no. trial pits to a depth between 2.1 and 2.5m (BH1, BH2 and BH4) and 25m (BH3).

3.4.4 Summary of soils encountered from exploratory holes can be seen within Table 4.

Table 4: Summary of Soils – LMB Geosolutions

Depth (m)	Soil Type	Description
GL – 0.2	TOPSOIL	Typically found to comprise dark brown clayey sand with occasional rootlets
GL– 0.55	MADE GROUND	Comprises light to dark brownish grey slightly clayey gravelly Sand. Gravel brick and concrete
0.8 – 3.2	UPPER TUNBRIDGE WELLS SAND	Typically found to comprise firm becoming stiff orangish brown mottled light grey locally sandy Clay. In locations SW1, SW6, SW7 and SW8 overlies strata typically recovered as Siltstone gravel and cobbles.

3.4.5 Note that no groundwater was encountered during the trial pit excavations.

3.4.6 Summary of the 5no. soakage test results can be seen in Table 5 below. Note that BRE Digest 365 was followed for testing purposes.

Table 5: Summary of Infiltration Tests – LMB Geosolutions

TP Ref	Depth (m)	BRE Units (m/sec)	Lithology of Test Section
SW1	2.1	8.04x10 ⁻⁶	Upper Tunbridge Wells Sand
SW2	2.5	3.01x10 ⁻⁷	
SW3	2.5	3.62x10 ⁻⁶	
SW4	2.5	1.5x10 ⁻⁶	
SW5	2.5	5.57x10 ⁻⁷	
SW6	2.5	7.16x10 ⁻⁶	
SW7	2.1	1.15x10 ⁻⁵	
SW8	2.5	3.49x10 ⁻⁵	

3.4.7 It’s noted within the report that the infiltration rates have been derived using the available data but this is not in accordance with the BRE 365 approach and it is recommended that this data should not be applied for drainage design for traditional soakaways.

3.4.8 It’s therefore understood that further infiltration tests are required to ensure compliance with BRE Digest 365.

3.4.9 Figure 3 below shows the locations of the exploratory holes referenced.

Figure 3: Site Investigation Plan – LMB Geosolutions



Source: LMB Geosolutions, Soakage Tests, LMB_24.08.20_PILLET_Downlands Park_Soakaways_v1.0_ALL

3.4.10 Review of results indicates that SW7 has the most suitable infiltration rate at 1.15x10⁻⁵. Note that the majority of these tests were carried out within the sandstone strata.

4.0 Supporting Evidence from Adjacent Development

4.1 Adjacent developments to the north, including Anchor and Goldbridge Care Home, successfully discharge surface water via infiltration into the same sand band identified on this site. Observations indicate the absence of drainage issues in the neighbouring development, which has operated effectively within the sand band.

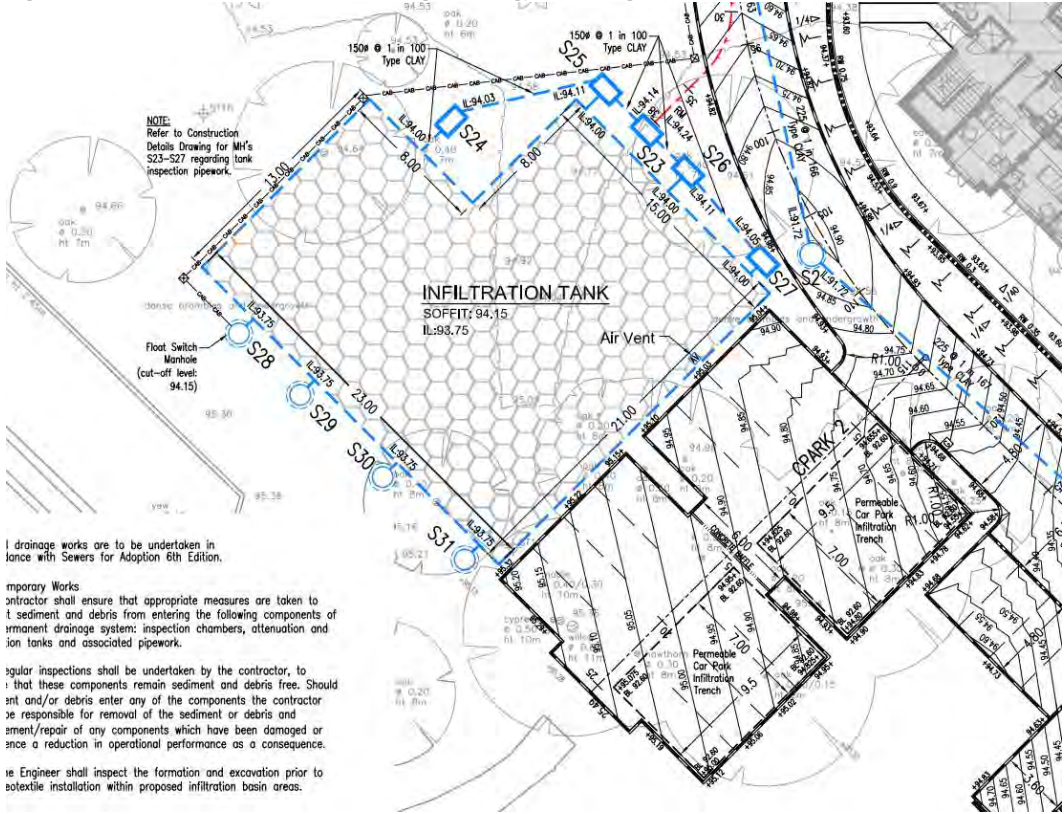
4.2 The adjacent site uses a shallow infiltration structure situated at approximately 1m below ground level, designed to receive pumped water from an attenuation structure. This setup suggests that similar site conditions can support shallow infiltration structures, reinforcing the viability of a sand band-based drainage solution for this site.

4.3 The infiltration structure is immediately adjacent the boundary extents to the north of the proposed site, as highlighted within this report. For ease, the infiltration structure is immediately adjacent CBR test locations CBR2 and CBR3 as shown in Figure 2.

4.4 Given the success of the infiltration system in the neighbouring development, there is a reasonable expectation that a similar system at the proposed site, targeting the sand band, will also perform well. This further justifies the shift from deep to shallow soakaways.

4.5 Figure 4 below illustrates the location of the infiltration structure at the neighbouring site to the north.

Figure 4: North Site Surface Water Drainage Strategy (Planning)



5.0 Estimated Sand Band

- 5.1 Figure 5 provides an estimated outline of a sand band within both the site and the neighbouring site to the north, based on the observed sand strata from on-site exploratory hole results.
- 5.2 The top layer of sandy soil was largely excluded due to its minimal depth (generally less than 500mm from ground level).
- 5.3 Figure 5 is intended as an indicative visualisation, offering an approximation of the sand band's extent.
- 5.4 The band is likely more extensive than illustrated, as its depiction relies on a limited number of tests; additional testing would enhance data accuracy and allow for a more precise extrapolation.

Figure 5: Estimated Sand Band



Source: Google Maps, Symmetrys Markup (2024)



6.0 Proposed Basin and Site Discharge

- 6.1 The proposed location of the infiltration basin aligns with the natural slope of the site, positioned at a lower elevation in the southern portion. This positioning allows the basin to make use of the natural topography to facilitate gravity-fed drainage.
- 6.2 Earlier design proposals also placed an attenuation basin in the southern area. However, this basin has since been adapted to incorporate infiltration, capitalising on favourable soil conditions that support infiltration discharge within this zone.
- 6.3 Refer to Appendix D for the current surface water drainage strategy.
- 6.4 In designing the surface water drainage network, an infiltration rate of 1.15×10^{-5} m/s was assumed, based on the best infiltration rate recorded on the northern part of the site. This rate was derived from test SW7, documented in the LMB Geosolutions Ltd Infiltration Soakaway Testing Report (August 2024, Report Ref. LMB_24.08.20_PILLET_Downlands Park_Soakaways_v1.0_ALL).
- 6.5 It should also be noted that infiltration tests were carried out in the sandstone strata. Therefore, it's expected that infiltration rates will be significantly better when carried out within the sand band.
- 6.6 The current design demonstrates that, even with the sandstone's low infiltration rate, the proposed attenuation basin is capable of containing runoff from a 1-in-100-year storm event, inclusive of climate change allowances.
- 6.7 Borehole data indicates that within the proposed basin area, sandstone is present at greater depths, requiring considerable excavation. Therefore, the current design may need to incorporate a pumped system to transfer stormwater from the basin to a dedicated infiltration structure. The specific location of the sand band, likely to the north, will be used to locate the infiltration structure. Further infiltration testing will be conducted to confirm the sand band's exact position and ensure compatibility with the proposed infiltration approach.
- 6.8 Section 4.0 details the neighbouring site's discharge strategy. Given similar ground conditions, the solution outlined in this report may need to adopt a comparable approach.
- 6.9 The proposed discharge method, subject to further infiltration tests, will be directing surface water into the shallow sand band primarily identified to the north. This sand band is expected to facilitate adequate infiltration for the site's requirements.

7.0 Foul Drainage

- 7.1.1 Foul water drainage strategy has been developed in accordance with local planning policy requirements, UK Government Planning Practice Guidance, Sewer Sector Guidance Design and Construction Guidance, Building Regulations, BS EN 752 and other relevant design standards and best practice guidance.
- 7.1.2 The foul water flow rates are calculated as per the current proposed design, therefore are subject to change with design updates.
- 7.1.3 The proposed foul water strategy is to utilise the existing below ground drainage network, where a proposed connection shall be made to the south east of the site, ref MH10 of the CCTV survey.
- 7.1.4 Therefore, the total proposed flow rate is 11.7 l/s for the site.
- 7.1.5 Foul water drainage strategy can be found within Appendix E.
- 7.2 For the purposes of this report, it is assumed that the drainage within the site shall be maintained by the riparian owner.

8.0 Next Steps and Recommendations

- 8.1 Additional tests shall be carried out in the proposed location and design depth of the infiltration structure to confirm suitability and lend credibility to the design rationale.

APPENDIX A

SOUTHERN TESTING GI

REPORT

Borehole & Soakage Report



Desk Studies | Risk Assessments | Site Investigations | Geotechnical | Contamination Investigations | Remediation Design and Validation

Site: Downlands Park, Haywards Heath, West Sussex

Client: The Lamb Group

Report Date: 29 January 2016

Project Reference: J12448

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FS 29280

EMS 506775

OHS 506776



A INTRODUCTION

1 Site Location

The site is located approximately 1km to the west of the centre of Haywards Heath. The approximate National Grid Reference of the site is TQ 320 237.

2 Investigation Brief

In accordance with the Client's instructions, and our quotation, the following was included in our brief for this preliminary investigation:

- 4 No. boreholes drilled to 10m (BH1-BH4), with groundwater monitoring well installation.
- 5 No. trial pit soakage tests (TP201-TP205) with an additional trial pit (TP206).
- Provision of borehole logs, soakage test results and contamination laboratory test results.

3 Scope

This report gives only a brief account of ground conditions. It is not a fully comprehensive site investigation report and it is not an engineering design document and should any information be used it should be noted that variations will apply, according to variations in design, in techniques used, and in site conditions. Our figures therefore should not supersede the final design. It is impossible to categorically define the extent of any contamination on site at this preliminary stage, due to the discrete number of sampling locations. The contamination screening values used are valid at the time of writing but may be subject to change and any such changes will have implications for the assessments based upon them. Their validity should be confirmed at the time of site development.

As with any site there may be differences in soil conditions between exploratory hole positions.

The work and the assessment report are prepared specifically for The Lamb Group and their appointed Engineers. Southern Testing Laboratories Limited owes no duty of care and skill to other parties.

The recommendations may not be appropriate to alternative development schemes.

The findings and opinions conveyed via this assessment are based on information obtained from a variety of sources as detailed within this report, and which Southern Testing Laboratories Limited believes are reliable. Nevertheless, Southern Testing Laboratories Limited cannot and does not guarantee the authenticity or reliability of the information it has obtained from others.



J Race MSc CGeol
(Countersigned)



C Lennard BEng
(Signed)

For and on behalf of Southern Testing Laboratories Limited

4 Geology

The British Geological Survey Map of the area (No. 302 – Horsham) indicates that the site geology consists of the Upper Tunbridge Wells Sand formation. The Upper Grinstead Clay and Cuckfield Stone formations are shown outcropping a short distance to the southwest.

Upper Tunbridge Wells Sand

This formation is similar to the lower part of the Lower Tunbridge Wells Sand and consists of variegated soft mudstones, clays, silts, thinly bedded sandstones and occasional clay ironstones. The deposits are characteristically lenticular and impersistent, meaning that variability is to be expected. The clays commonly weather to red and the silts to mottled grey and orange ("catsbrain"). There are seams of harder rock from place to place, which cause difficulties to mechanical plant and may require drilling and blasting for economic excavation.

Grinstead Clay

The Grinstead Clay consists of shales, mudstones and silty mudstones with subordinate beds of silt, clay ironstone, and shelly limestone. It is frequently divided by calcareous sandstone (the Tilgate Stone or Cuckfield Stone) that is up to about 6m thick. As it is more resistant to weathering than the clay it is often found as a cap rock close to the land surface.

Near the surface the clay is often softened and may have poor bearing properties. Being highly plastic it may suffer from summer drying shrinkage or winter wetting swelling, particularly near trees, and precautions are generally required to prevent foundation damage.

Near the crests of escarpments reflective cracking may be found over the fissuring in the underlying Ardingly Sandstone.

Cuckfield Stone

The Cuckfield Stone is a flaggy bedded fine grained calcareous sandstone up to about 6m thick that separates the Upper and Lower Grinstead Clay. As it is more resistant to weathering than the clay it is often found as a cap rock close to the land surface.

5 Hydrology and Hydrogeology

Selected data from the Environment Agency and other information relating to controlled waters is summarised below.

Data		Remarks
Aquifer Designation	Superficial Deposits	There are no superficial deposits mapped present.
	Bedrock	The Upper Tunbridge Wells Sand formation is classified as a Secondary A Aquifer.
Groundwater Vulnerability		The ground conditions underlying the site are classified as a Minor Aquifer with soils of Intermediate leaching potential.
Source Protection Zones		The site does not lie within a groundwater Source Protection Zone (SPZ).
Surface Water Features		The nearest surface watercourse appears to be a stream located approximately 200m to the southwest of the subject site.

Data	Remarks
Marine/Fluvial Flood Risk	On the basis of the Environment Agency mapping (Jan 2016) the site is not shown to lie within a flood risk zone.
Surface Water Flood Risk	On the basis of the Environment Agency mapping (Jan 2016) the site is not shown to lie within a flood risk zone.
Reservoir Flood Risk	On the basis of the Environment Agency mapping (Jan 2016) the site is not shown to lie within a flood risk zone.

6 Site Description

The subject site forms part of the grounds of a care home, the majority of which comprises grassed areas, together with numerous trees, hedges and bushes/shrubs.

In general, the site slopes down towards the southwest at approximately 3-10°. Regionally, the site is at the crest of a slight ridge with gentle slopes down both towards the north and towards the south.

A series of photographs showing the site at the time of the investigation are included in Appendix B.

B FIELDWORK

7 Soils as Found

The soils encountered are described in detail in the attached exploratory hole logs (Appendix A), with a generalised summary given in the table below.

Depth	Soil Type	Description
GL – 0.2/0.5m	TOPSOIL/ MADE GROUND	Brown, silty/sandy CLAY, with occasional flint gravel and brick fragments.
– 2.0/10.5m	VARIABLE	Firm to stiff, orange/yellow brown, silty/sandy CLAY, with variable bands/fragments of weak siltstone, sandstone and mudstone.

8 Soakage Test Method

Soakage Tests after BRE365 (1991)

The BRE365 paper on soakaway design allows for the design of trench soakaways as well as traditional square and circular soakaways.

The test to measure the soil infiltration rate is carried out in pits which are excavated to the full depth of the proposed soakaway. The trial pits are filled and allowed to drain to empty or near empty, three times, on the same day or on consecutive days.

The pit is considered full when the water level is the same as the proposed inlet invert. The time

for the water level to fall from $\frac{3}{4}$ full to $\frac{1}{4}$ full is obtained and the soil infiltration rate is obtained from the following formula:

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

Where: f = soil infiltration rate (in this case expressed in $\ell/m^2/\text{minute}$)

V_{p75-25} = the effective storage volume of water in the trial pit between 75% and 25% effective depth;

a_{p50} = the internal surface area of the trial pit up to 50% effective depth and excluding the base area;

t_{p75-25} = the time for the water level to fall from 75% to 25% effective depth.

The soakage rate in this report is expressed as $\ell/m^2/\text{minute}$, which is a convenient rate to use. The BRE use a unit of m/sec , which is the value in $\ell/m^2/\text{minute}$ divided by 60,000.

Because of time and cost constraints testing was restricted to a maximum of one day of testing per trial pit.

9 Soakage Test Results & Discussion

A total of 5 No. soakage tests were carried out across the site (TP201-TP205), at the locations shown on the attached site plan (Figure 1). The full results of the soakage tests are appended (Appendix C), however, the soakage rate from each trial hole is summarised in the table below.

Results of BRE 365 Soakage tests				
Hole ID	Depth (m)	f ($\ell/m^2/\text{min}$)	BRE Units (m/sec)	Comments
TP201	3.0	0.00	n/a	No water level fall in 240 mins
TP202	3.0	0.005	7.6×10^{-8}	Water level fell only 0.02m in 240 mins
TP203	3.0	n/a	n/a	Water level rose 0.01m over the course of the test due to near surface seepages.
TP204	2.0	0.04	6.9×10^{-7}	Water level fell only 0.08m in 240 mins
TP205	2.5	0.02	2.8×10^{-7}	Water level fell only 0.09m in 240 mins

NB – An additional trial pit (TP206) was carried out in between trial pits TP204 and TP205 to assess ground conditions, however, this was not used for soakage testing purposes.

Observed soakage rates were generally very low to negligible, but not untypical in the soils encountered given our local experience of the area.

The BRE Digest 365 indicates that 3 fillings must be carried out; which was not the case given the poor soakage rates experienced and time restrictions at this site, therefore, during this investigation it was only possible to carry out 1 filling per trial pit. Where 3 fillings have not been carried out, a reduction factor should be applied.

10 Groundwater Monitoring Wells

As part of this work groundwater monitoring wells have been installed in the four boreholes (BH1-BH4). A programme of twelve monthly monitoring visits are to be undertaken, the results of two of these are tabulated below, with the remainder to be reported separately.

Hole ID	Standing Water Level (bgl)	
	10 Dec 2015	15 Jan 2016
BH1	1.32m	0.97m
BH2	2.02m	1.22m
BH3	3.45m	1.21m
BH4	*	4.89m

** - Borehole not yet installed*

11 Contamination Results and Comments

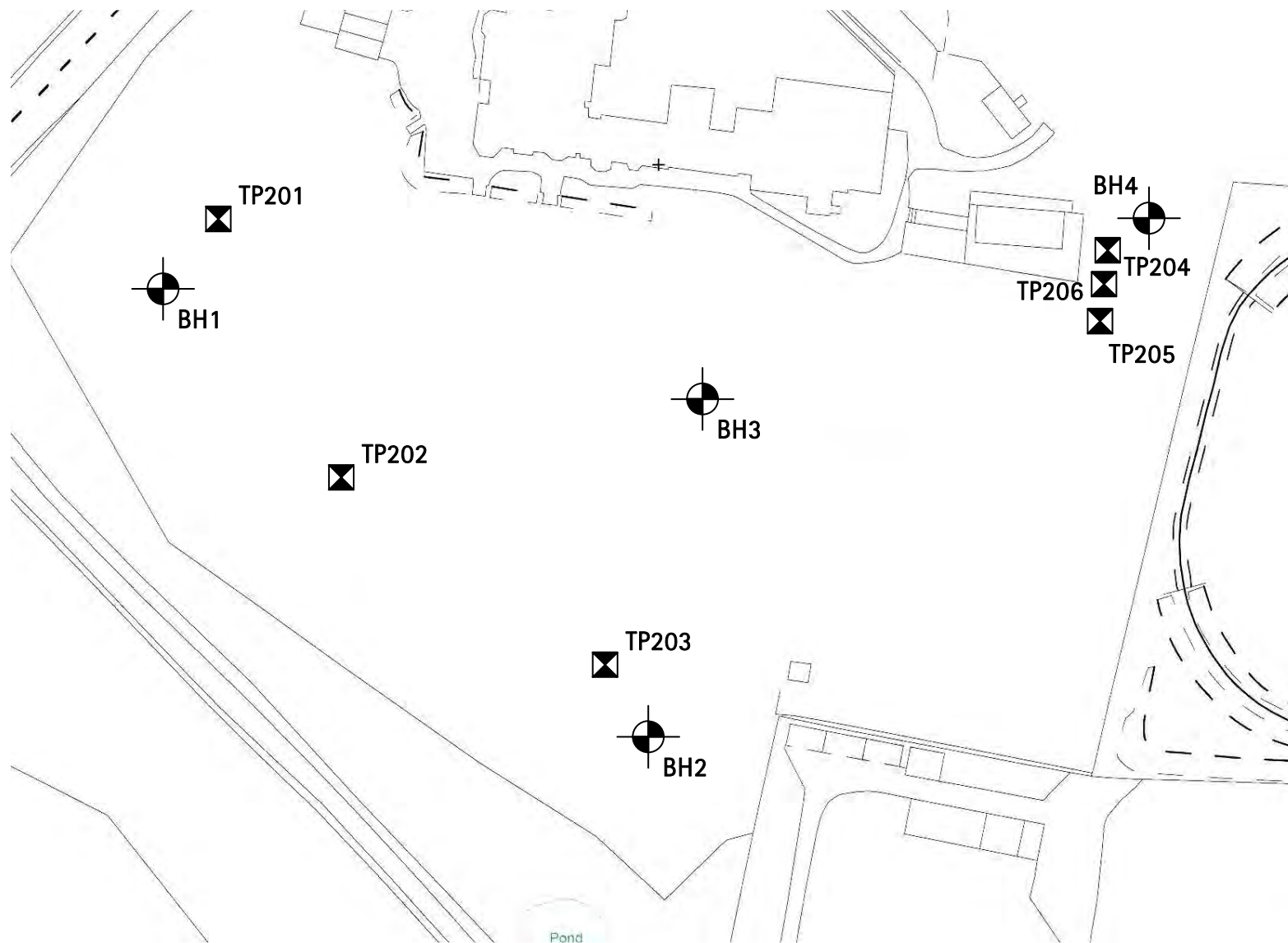
As an initial assessment of any made ground soils in the vicinity of possible proposed soakaways, contamination laboratory testing was carried out on selected samples.

Test Suite	Number of Samples	Soil Tested
STL Key Contaminant Suite	3	Made Ground / Topsoil with occasional ash
Presence & ID of Asbestos	3	Made Ground / Topsoil with occasional ash

The test results are presented in full in Appendix D.

The soils analysed within the 3 No. Key Contaminants Suite tests were free from significant contamination. By way of comment, the contaminant concentrations measured all fall below the relatively stringent tier 1 screening values for a residential land-use, for example. This concurs with the visual and olfactory evidence.

APPENDIX A – SITE PLAN & TRIAL HOLE LOGS



NB: Positions of Boreholes and/or Trial Pits are only indicative unless dimensioned

Site: Downlands Park, Haywards Heath

STL: J12448

Fig No: 1

Date: December 2015

Site Investigation Plan (not to scale)

 Southern Testing

Southern Testing: Keeble House, Stuart Way, East Grinstead, West Sussex RH19 4QA
ST Consult: Twigden Barns, Brixworth Road, Creton, Northampton NN6 8NN

 ST Consult

Logger:

HC

End of shift 16/11/2015; BH: 5.3m, Cas: 2.3m, Water: 2.4m. Start of shift 17/11/2015; BH: 4.1m, Cas: 2.3m, Water: 1.7m. End of drilling 17/11/2015; BH: 10.4m, Cas: 2.3m, Water: 1.1m. Water level 24/11/2015 (am): 1.09m.

Client:	The Lamb Group
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Continued on Next Sheet[illegible]

Remarks:

Logger:

HC

End of shift 16/11/2015; BH: 5.3m, Cas: 2.3m, Water: 2.4m. Start of shift 17/11/2015; BH: 4.1m, Cas: 2.3m, Water: 1.7m. End of drilling 17/11/2015; BH: 10.4m, Cas: 2.3m, Water: 1.1m. Water level 24/11/2015 (am): 1.09m.

The Lamb Group

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Logger:

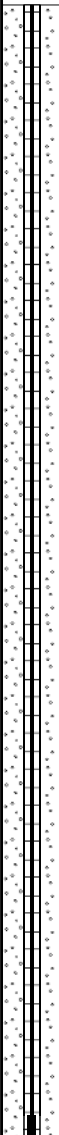
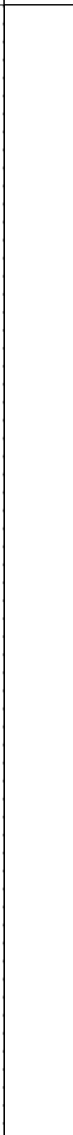
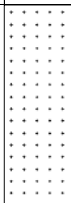
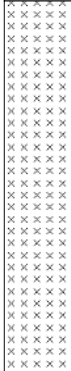
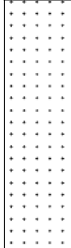
HC

End of shift 18/11/2015; BH: 5.3m, Cas: 3.0m, Water: 3.1m. Start of shift 19/11/2015; BH: 4.0m, Cas: 3.0m, Water: 0.95m. End of drilling 19/11/2015: BH: 10.5m, Cas: 3.0m, Water: 4.1m. Water level 24/11/2015 (am): 1.89m.

Client:	The Lamb Group
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Continued on Next Sheet

Hole Details		Casing Details		Water Strike (m bgl)				Readings (m bgl)		Standing/Chiselling (m bgl)			
Depth (m bgl)	Diameter	Depth (m bgl)	Dia. (mm)	Date	Depth	Casing	Sealed	Rose to:	Time (min)	From	To	Time	Remarks
10.50	116	3.00	128	18-11-2015	3.10	3.00							

					Start - End Date:			Project ID:		Hole Type:		BH2	
www.southerntesting.co.uk tel:01342 333100 www.stconsult.co.uk tel:01604 500020					18/11/2015 - 19/11/2015			J12448		WLS+RC		Sheet 2 of 2	
Project Name: Downlands Park					Remarks:			Co-ordinates:		Level (m AOD)		Logger:	
												HC	
Location: Isaacs Lane, Haywards Heath, West Sussex					End of shift 18/11/2015; BH: 5.3m, Cas: 3.0m, Water: 3.1m. Start of shift 19/11/2015; BH: 4.0m, Cas: 3.0m, Water: 0.95m. End of drilling 19/11/2015: BH: 10.5m, Cas: 3.0m, Water: 4.1m. Water level 24/11/2015 (am): 1.89m.								
Client: The Lamb Group													
Well	Water Strikes	Samples and Insitu Testing			Coring			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type/FI	Results	TCR	SCR	RQD						
		6.00 - 7.50			100	87	53	6.80	(1.40)		<u>Burrowing trace fossil</u>	7	
		7.50 - 9.00			100	100	93	7.50	(2.00)		Extremely weak pale grey silty MUDSTONE, with occasional ironstained tight fractures to 7.3m		
											Weak grey SILTSTONE with occasional ironstained fractures.	8	
											<u>Extremely weak to weak</u>	9	
		9.00 - 10.50			100	100	86	9.50	(1.00)		Medium strong light grey fine SANDSTONE with occasional ironstaining	10	
							10.50			End of Borehole at 10.500m	11		
												12	
Hole Details		Casing Details		Water Strike (m bgl)			Readings (m bgl)			Standing/Chiselling (m bgl)			
Depth (m bgl)	Diameter	Depth (m bgl)	Dia. (mm)	Date	Depth	Casing	Sealed	Rose to:	Time (min)	From	To	Time	Remarks
10.50	116	3.00	128	18-11-2015	3.10	3.00							

Logger:

HC

End of shift 19/11/2015; BH: 1.9m, Cas: 1.5m, Water: 1.2m. Start of shift 20/11/2015; BH: 1.9m, Cas: 1.5m, Water: 0.25m. End of shift 20/11/2015; BH: 10.05m, Cas: 3.0m, Water: 2.65m.

The Lamb Group

[illegible]

Project Name:	Downlands Park
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Remarks:

Co-ordinates:

Level (m AOD)

Logger:

Location:

Isaacs Lane, Haywards Heath, West
Sussex

End of shift 19/11/2015; BH: 1.9m, Cas: 1.5m, Water: 1.2m. Start of shift 20/11/2015; BH: 1.9m, Cas: 1.5m, Water: 0.25m. End of shift 20/11/2015; BH: 10.05m, Cas: 3.0m, Water: 2.65m.

Client:

The Lamb Group

[illegible]

Logger:

HC

End of shift 10/12/2015; BH: 7.4m, Cas: 3.5m, Water: 6.8m. Start of shift 11/12/2015; BH: 7.4m, Cas: 3.5m, Water: 6.3m. End of drilling 17/11/2015; BH: 10.1m, Cas: 3.5m, Water: 6.4m.

Client:	The Lamb Group
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[illegible]

Remarks:

Logger:

End of shift 10/12/2015; BH: 7.4m, Cas: 3.5m, Water: 6.8m. Start of shift 11/12/2015; BH: 7.4m, Cas: 3.5m, Water: 6.3m. End of drilling 17/11/2015; BH: 10.1m, Cas: 3.5m, Water: 6.4m.

Client:	The Lamb Group
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[illegible]

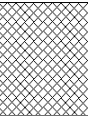
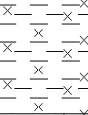
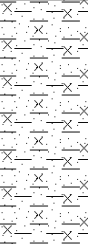
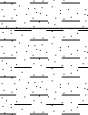
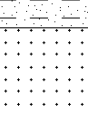
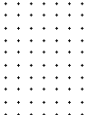
Remarks:

Level (m AOD):

Logger:

HC

Client:	The Lamb Group
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Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description	
Depth (m)	Type	Results						
0.5	HP	UCS(kPa)=190		(0.30)		0.30	Grass over brown silty slightly sandy CLAY with frequent fine rootlets. TOPSOIL	
				(0.20)		0.50	Firm to stiff brown and light yellow brown slightly silty CLAY	
				(0.40)		0.90	Stiff high strength light yellow brown mottled light grey and red brown silty slightly fine sandy CLAY	
1.0	HP	UCS(kPa)=240		(1.00)		1.90	Stiff high strength pale grey mottled light yellow brown and orange brown silty slightly fine sandy CLAY with occasional fine sandy patches, with occasional extremely weak fine sandstone.	1
1.6	HP	UCS(kPa)=460				2.10	Very stiff very high strength pale grey and light yellow brown fine sandy CLAY	2
2.1	HP	UCS(kPa)=550		(0.20)		2.40	Very stiff thinly bedded very closely fissured extremely high strength light grey mottled light yellow brown very sandy CLAY ironstained fissures	
				(0.30)		3.00	Extremely weak to weak thinly bedded pale grey and yellow brown silty fine SANDSTONE with occasional ironstaining.	
				(0.60)			Pit terminated at 3.00m.	
Pit Dimension (m)			Pit Stability:				Water Strikes:	
Width:	0.45		Stable					Seepage from topsoil to 0.3m
Length:	2.40							
Depth:	3.00							

Project Name:

Downlands Park

Remarks:

Co-ordinates:

Level (m AOD):

Logger:

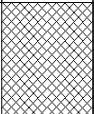
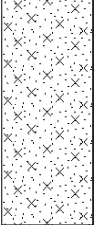
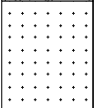
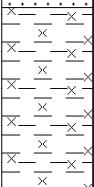
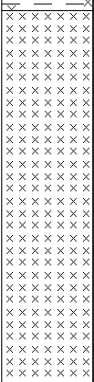
HC

Location:

Isaacs Lane, Haywards Heath, West Sussex

Client:

The Lamb Group

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description	
Depth (m)	Type	Results						
0.2	ES			(0.30)		0.30	Grass over brown slightly silty gravelly CLAY with frequent rootlets. Gravel consists of fine to medium sub-angular flint, brick, concrete and blacktop. MADE GROUND	
				(0.20)		0.50	Blacktop	
				(0.10)		0.60	Pale brown and orange brown silty fine sandy CLAY	
				(0.60)		1.20	Pale yellow brown silty fine SAND with occasional extremely weak sandstone patches	1
				(0.30)		1.50	Extremely weak pale grey and light yellow brown fine SANDSTONE	
				(0.50)		2.00	Stiff very closely fissured, very high strength light orange brown mottled pale grey slightly silty CLAY	2
				(1.00)		3.00	Extremely weak to weak thinly bedded very closely fractured SILTSTONE interbedded with MUDSTONE/ SANDSTONE	3
							Ironstaining	
							Pit terminated at 3.00m.	4

Pit Dimension (m)

Pit Stability:

Water Strikes:

Width:

0.45

Stable

Seepage to 0.5m

Length:

2.20

Depth:

3.00

Project Name: Downlands Park

Remarks:

Co-ordinates:

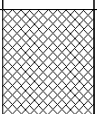
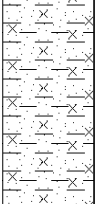
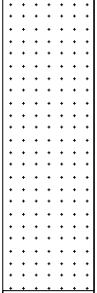
Level (m AOD):

Logger:

HC

Location: Isaacs Lane, Haywards Heath, West Sussex

Client: The Lamb Group

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description	
Depth (m)	Type	Results						
0.9	HP	UCS(kPa)=160		(0.30)		0.30	Grass over brown silty fine sandy CLAY with frequent fine rootlets, occasional sub-rounded flints. TOPSOIL	1
				(0.20)		0.50	Firm yellow brown mottled light orange brown and brown silty slightly fine sandy CLAY with occasional fine brick fragments. MADE GROUND	
				(0.20)		0.70	Firm yellow brown mottled light orange brown and brown silty slightly fine sandy CLAY.	
1.5	HP	UCS(kPa)=350		(1.10)		1.80	Firm high strength pale grey mottled light yellow brown slightly silty slightly fine sandy CLAY	2
				(0.40)		2.20	Very stiff very closely fissured extremely high strength orange brown mottled pale grey silty CLAY with occasional ironstaining.	
				(0.80)		3.00	Extremely weak to weak very thinly bedded very closely fissured pale grey and light orange brown fine SANDSTONE Interbedded with mudstone	
2.1	HP	UCS(kPa)=560					Pit terminated at 3.00m.	3
								4

Pit Dimension (m)

Pit Stability:

Water Strikes:

Width: 0.45

Length: 2.20

Depth: 3.00

Stable

Slight seepage from 0.3 - 0.5m

Start - End Date:

21/12/2015

Project ID:

J12448

Machine Type:

5t Yanmar

TP204

Sheet 1 of 1

Project Name: Downlands Park

Remarks:

Co-ordinates:

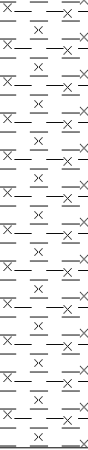
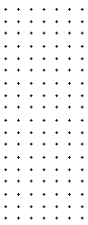
Level (m AOD):

Logger:

HC

Location: Isaacs Lane, Haywards Heath, West Sussex

Client: The Lamb Group

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description	
Depth (m)	Type	Results						
0.2	ES			(0.20)		0.20	Dark brown silty gravelly CLAY. Gravel consists of brick concrete, flint and ash with frequent roots. MADE GROUND Stiff yellow brown mottled light grey silty CLAY	1
				(1.20)		1.40	Extremely weak light orange brown and pale grey weathered fine SANDSTONE/ SILTSTONE	2
				(0.60)		2.00	Pit terminated at 2.00m.	4

Pit Dimension (m)

Pit Stability:

Water Strikes:

Width:

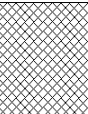
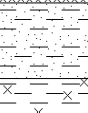
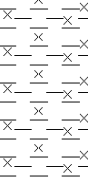
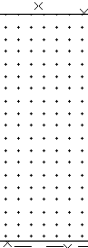
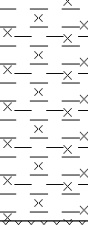
Stable

None

Length:

Depth:

2.00

				Start - End Date: 21/12/2015		Project ID: J12448		Machine Type: 5t Yanmar		TP205 Sheet 1 of 1	
Project Name: Downlands Park				Remarks:		Co-ordinates:		Level (m AOD):		Logger: HC	
Location: Isaacs Lane, Haywards Heath, West Sussex											
Client: The Lamb Group											
Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description				
Depth (m)	Type	Results									
0.2	ES			(0.30)		0.30	Dark brown silty gravelly CLAY. gravel consists of fine to coarse sub-angular to sub-rounded brick, concrete, flint, clinker, and ash with occasional whole bricks and frequent roots. MADE GROUND		1 2 3 4		
				(0.20)			Stiff light yellow brown slightly silty fine sandy CLAY.				
				(0.60)		0.50	Stiff light orange brown mottled pale grey silty CLAY				
				(0.60)		1.10	Extremely weak thinly laminated light yellow brown weathered fine SANDSTONE				
				(0.60)		1.70	Very stiff pale grey mottled light yellow brown very closely fissured very silty CLAY/ clayey SILT				
				(0.20)		2.30	Extremely weak SILTSTONE				
						2.50	Pit terminated at 2.50m.				
				Pit Dimension (m)			Pit Stability:				
Width:			Stable				None				
Length:											
Depth:	2.50										

Start - End Date:

21/12/2015

Project ID:
J12448
Machine Type:

5t Yanmar

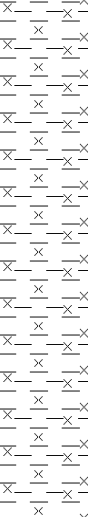
TP206
Sheet 1 of 1
Project Name: Downlands Park

Remarks:
Co-ordinates:
Level (m AOD):
Logger:

HC

Location: Isaacs Lane, Haywards Heath, West Sussex

Client: The Lamb Group

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description	
Depth (m)	Type	Results						
				(0.20)		0.20	Dark brown silty gravelly CLAY. Gravel is fine to coarse sub-angular to sub-rounded brick and flint. MADE GROUND Stiff to very stiff fissured silty CLAY	
				(1.40)		1.60	Extremely weak weathered SILTSTONE/ SANDSTONE	1
				(0.50)		2.10	Very stiff pale grey CLAY	2
				(0.10)		2.20	Pit terminated at 2.20m.	3
								4

Pit Dimension (m)
Pit Stability:
Water Strikes:
Width:

Stable

None

Length:
Depth:

2.20

APPENDIX B – PHOTOGRAPHS



Photo 1 – View of the grassed area from the NW (looking S)



Photo 2 – View of the grassed area from the NW (looking E)



Photo 3 – View of the grassed area from the E (looking W)



Photo 4 – View of the grassed area from the SW (looking N)



Photo 5 – View of the overgrown area from the E (looking W)



Photo 6 – View of the overgrown area from the E (looking S)



Photo 7 – View of the overgrown area from the E (looking NE)

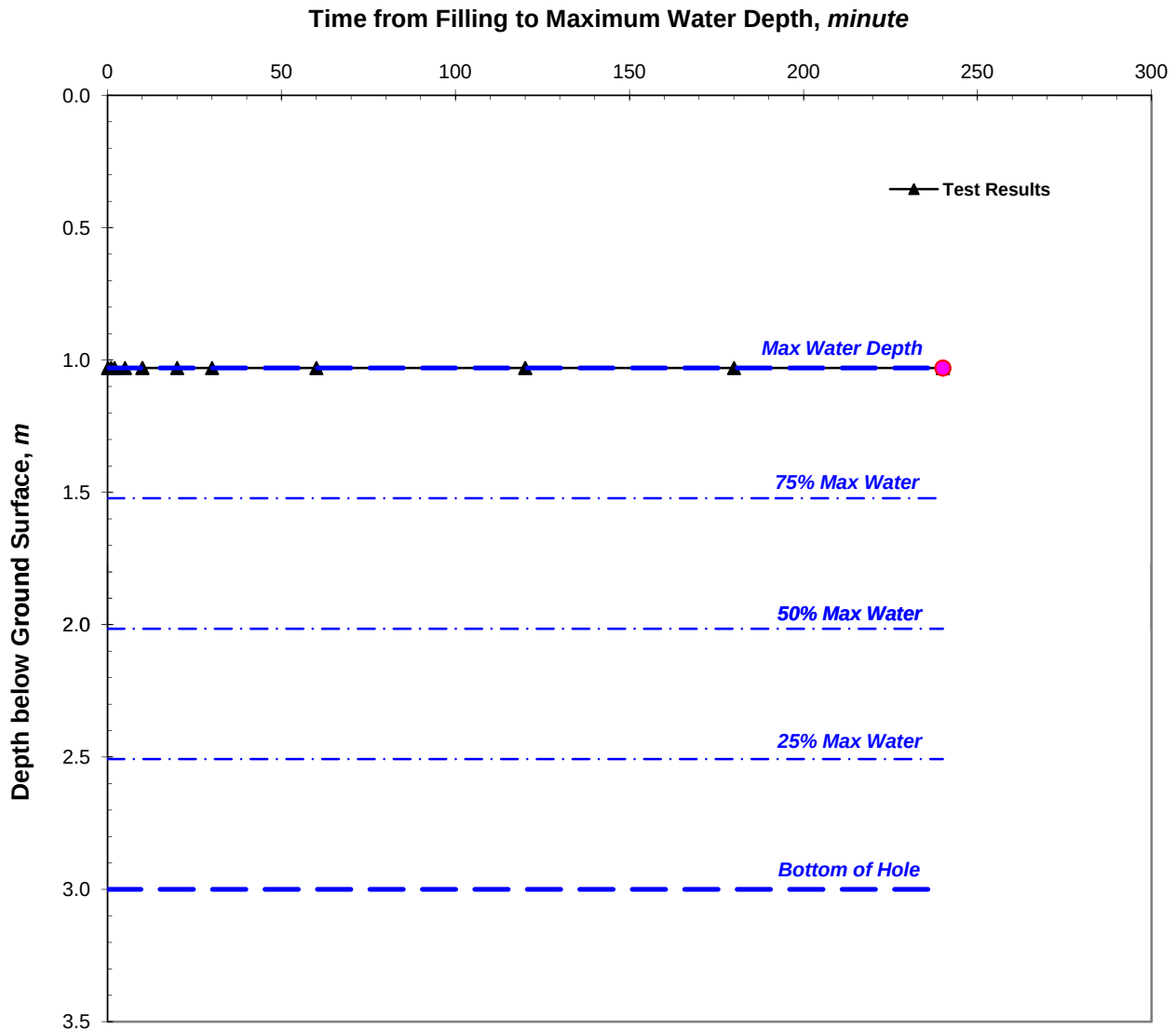


Photo 8 – Miniature railway tunnel/cutting to the SE of the overgrown area

APPENDIX C – SOAKAGE TEST RESULTS

BRE Digest 365 Soakage Test

Test Hole No: TP201
Test No: Test No 1 (Initial)



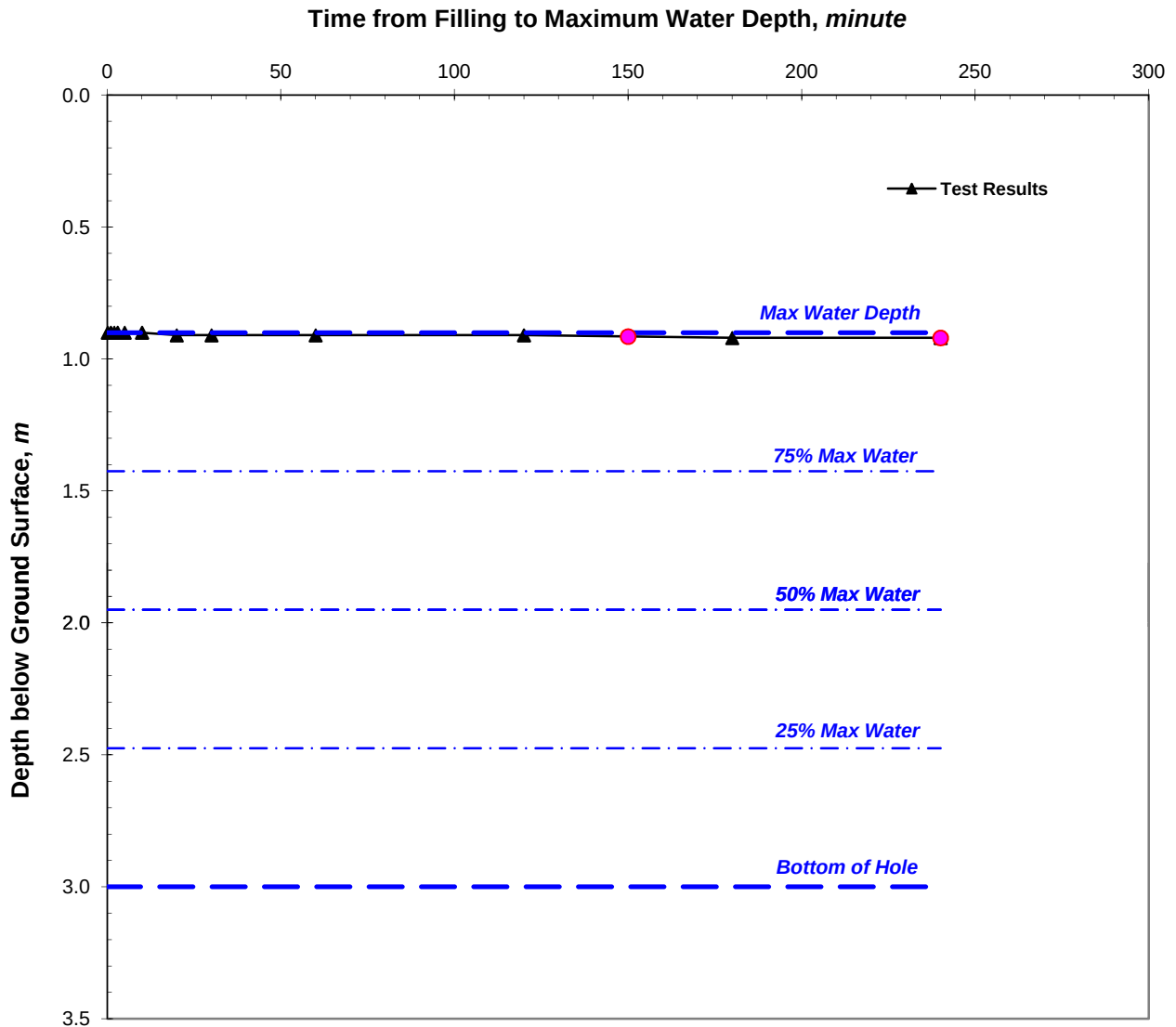
Pit Length, m	2.600	Depth to Water at Start of Test, <i>m</i>	1.030
Pit Width, m	0.450	Max Water Dropdown during Test, <i>m</i>	0.000
Depth to Pit Base, m	3.000	Total Soakage Test Time, <i>min</i>	240.0
Depth to Top of Permeable Soils, <i>m</i>		Mean Internal Discharge Area, <i>m</i> ²	13.187
Depth to Groundwater Surface, <i>m</i>		Discharge Rate, <i>litre/min</i>	0.000
Depth to Top of Granular Fill, <i>m</i>		Soakage Rate, <i>litre/m</i> ² / <i>min</i>	0.0000
Voids Assumed for Granular Fill, %	100%	BRE Soil Infiltration Rate, <i>m/sec</i>	0.00E+00

Comments: *water seepage at 0.3m*
Water level rose during the test. Soakage rate calculation is not applicable
Result not compliant with BRE365 requirement since water did not fall to 25% max water depth.

Client: The Lamb Group	Job No: J12448	Test Date: 24/Nov/2015
Site: Land at Downlands, Isaacs Lane, Haywards	Tested By: AA	Engineer: CL
		Fig. S1

BRE Digest 365 Soakage Test

Test Hole No: TP202
Test No: Test No 1 (Initial)



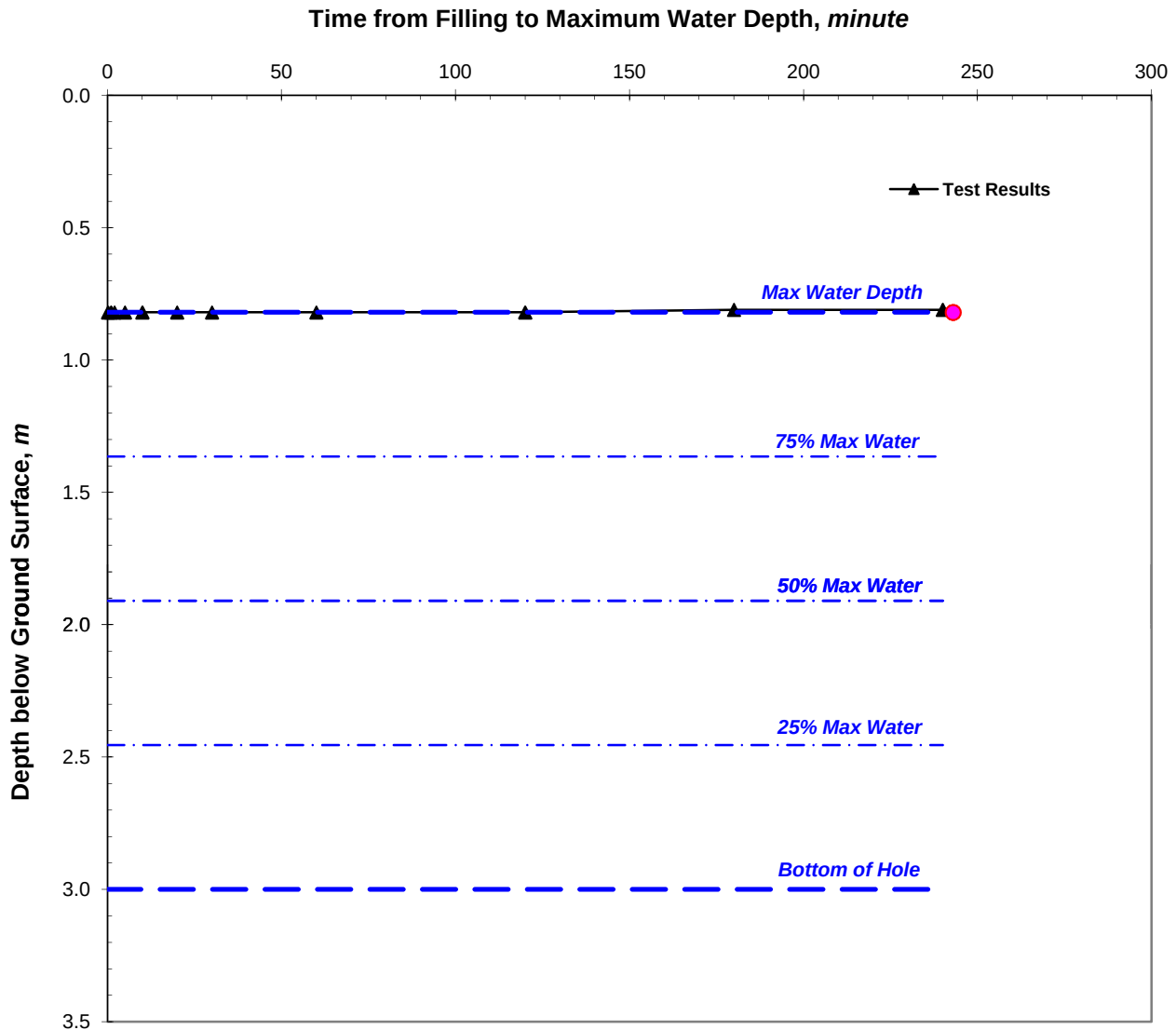
Pit Length, <i>m</i>	2.200	Depth to Water at Start of Test, <i>m</i>	0.900
Pit Width, <i>m</i>	0.450	Max Water Dropdown during Test, <i>m</i>	0.020
Depth to Pit Base, <i>m</i>	3.000	Total Soakage Test Time, <i>min</i>	240.0
Depth to Top of Permeable Soils, <i>m</i>		Mean Internal Discharge Area, <i>m</i> ²	12.027
Depth to Groundwater Surface, <i>m</i>		Discharge Rate, <i>litre/min</i>	0.055
Depth to Top of Granular Fill, <i>m</i>		Soakage Rate, <i>litre/m</i> ² / <i>min</i>	0.0046
Voids Assumed for Granular Fill, %	100%	BRE Soil Infiltration Rate, <i>m/sec</i>	7.62E-08

Comments: **Water seepage to 0.5m**
Water level rose during the test. Soakage rate calculation is not applicable
Result not compliant with BRE365 requirement since water did not fall to 25% max water depth.

Client: The Lamb Group	Job No: J12448	Test Date: 25/Nov/2015
Site: Land at Downlands, Isaacs Lane, Haywards	Tested By: AA	Engineer: CL Fig. S2

BRE Digest 365 Soakage Test

Test Hole No: TP203
Test No: Test No 1 (Initial)



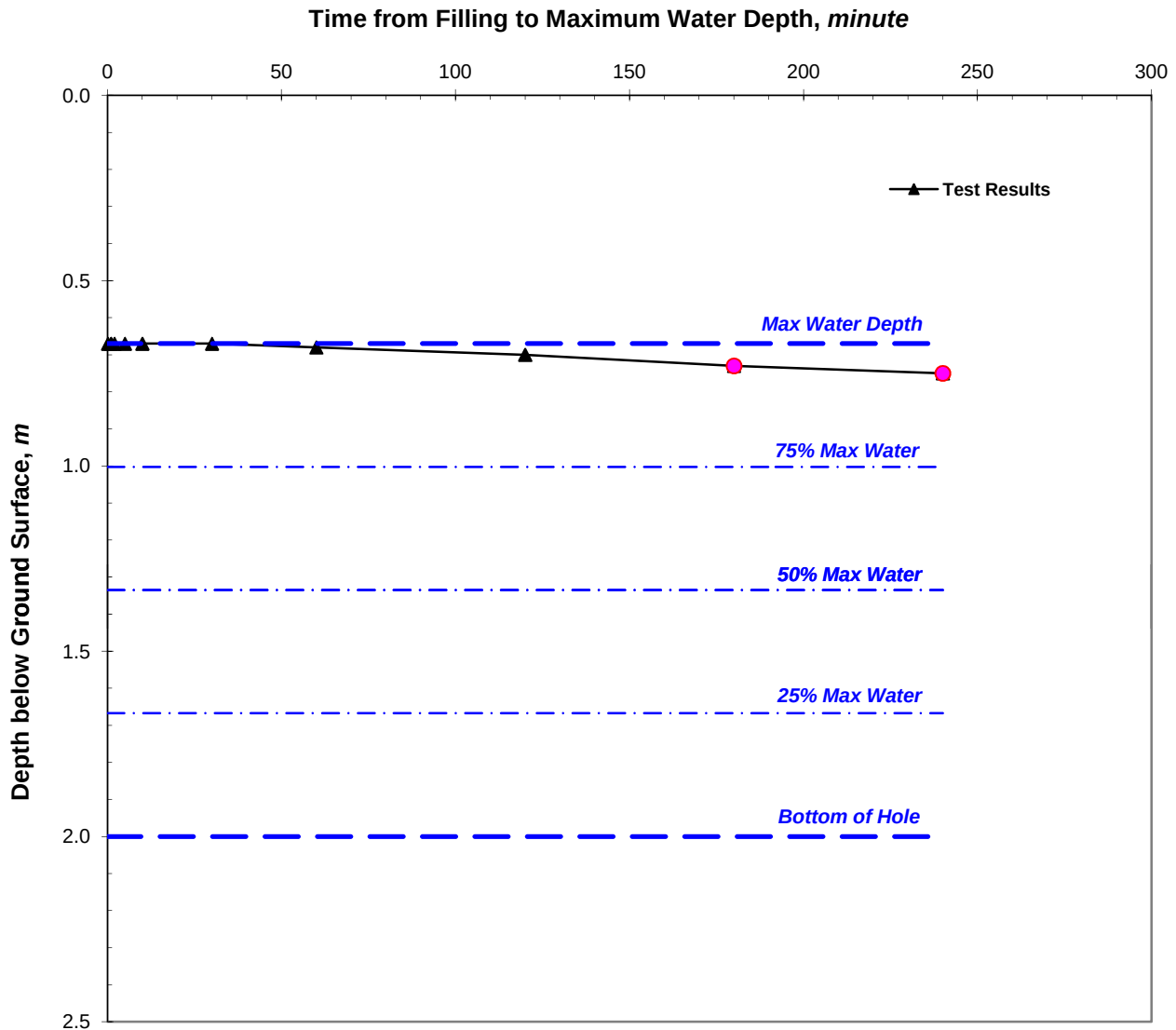
Pit Length, <i>m</i>	2.200	Depth to Water at Start of Test, <i>m</i>	0.820
Pit Width, <i>m</i>	0.450	Max Water Dropdown during Test, <i>m</i>	0.000
Depth to Pit Base, <i>m</i>	3.000	Total Soakage Test Time, <i>min</i>	240.0
Depth to Top of Permeable Soils, <i>m</i>		Mean Internal Discharge Area, <i>m</i> ²	12.544
Depth to Groundwater Surface, <i>m</i>		Discharge Rate, <i>litre/min</i>	
Depth to Top of Granular Fill, <i>m</i>		Soakage Rate, <i>litre/m</i> ² / <i>min</i>	N/A
Voids Assumed for Granular Fill, %	100%	BRE Soil Infiltration Rate, <i>m/sec</i>	N/A

Comments: **Water seepage from 0.3 to 0.5m**
Water level rose during the test. Soakage rate calculation is not applicable

Client: The Lamb Group	Job No: J12448	Test Date: 26/Nov/2015
Site: Land at Downlands, Isaacs Lane, Haywards	Tested By: AA	Engineer: CL Fig. S3

BRE Digest 365 Soakage Test

Test Hole No: TP204
Test No: Test No 1 (Initial)



Pit Length, <i>m</i>	1.700	Depth to Water at Start of Test, <i>m</i>	0.670
Pit Width, <i>m</i>	0.450	Max Water Dropdown during Test, <i>m</i>	0.080
Depth to Pit Base, <i>m</i>	2.000	Total Soakage Test Time, <i>min</i>	240.0
Depth to Top of Permeable Soils, <i>m</i>		Mean Internal Discharge Area, <i>m</i> ²	6.183
Depth to Groundwater Surface, <i>m</i>		Discharge Rate, <i>litre/min</i>	0.255
Depth to Top of Granular Fill, <i>m</i>		Soakage Rate, <i>litre/m</i> ² / <i>min</i>	0.041
Voids Assumed for Granular Fill, %	100%	BRE Soil Infiltration Rate, <i>m/sec</i>	6.87E-07

Comments:

Water level rose during the test. Soakage rate calculation is not applicable

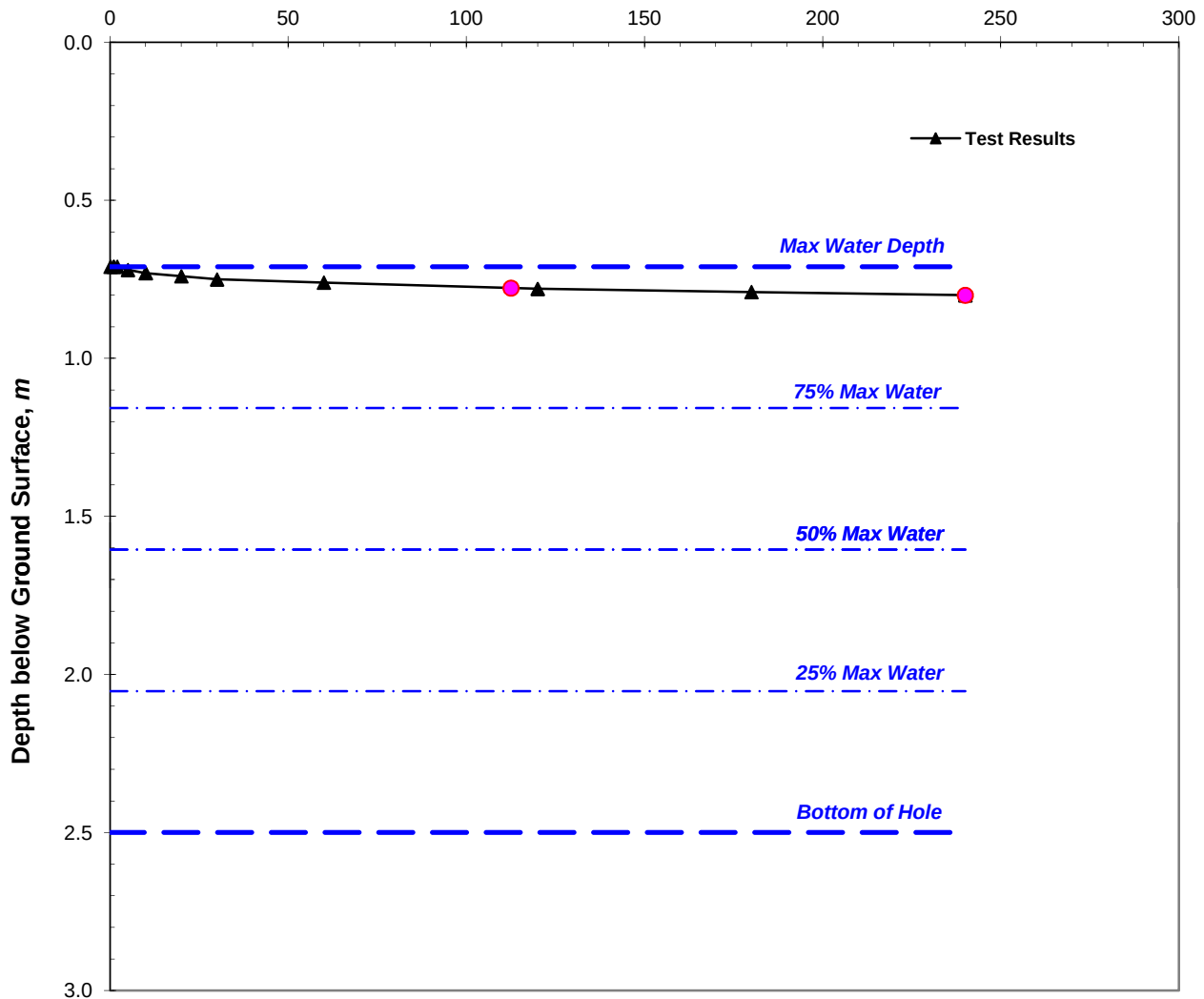
Result not compliant with BRE365 requirement since water did not fall to 25% max water depth.

Client: The Lamb Group	Job No: J12448	Test Date: 21/Dec/2015
Site: Land at Downlands, Isaacs Lane, Haywards	Tested By: AA	Engineer: CL
		Fig. S4

BRE Digest 365 Soakage Test

Test Hole No: TP205
Test No: Test No 1 (Initial)

Time from Filling to Maximum Water Depth, *minute*



Pit Length, m	1.800	Depth to Water at Start of Test, <i>m</i>	0.710
Pit Width, m	0.450	Max Water Dropdown during Test, <i>m</i>	0.090
Depth to Pit Base, m	2.500	Total Soakage Test Time, <i>min</i>	240.0
Depth to Top of Permeable Soils, <i>m</i>		Mean Internal Discharge Area, <i>m</i> ²	8.511
Depth to Groundwater Surface, <i>m</i>		Discharge Rate, <i>litre/min</i>	0.143
Depth to Top of Granular Fill, <i>m</i>		Soakage Rate, <i>litre/m</i> ² / <i>min</i>	0.017
Voids Assumed for Granular Fill, %	100%	BRE Soil Infiltration Rate, <i>m/sec</i>	2.80E-07

Comments:

Water level rose during the test. Soakage rate calculation is not applicable

Result not compliant with BRE365 requirement since water did not fall to 25% max water depth.

Client: The Lamb Group	Job No: J12448	Test Date: 21/Dec/2015
Site: Land at Downlands, Isaacs Lane, Haywards	Tested By: AA	Engineer: CL
		Fig. S5

APPENDIX D – CONTAMINATION LABORATORY TEST RESULTS

Scientific Analysis Laboratories Ltd

Certificate of Analysis

3 Crittall Drive
Springwood Industrial
Estate
Braintree
Essex
CM7 2RT
Tel : 01376 560120
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Scientific Analysis Laboratories is a
limited company registered in England and
Wales (No 2514788) whose address is at
Hadfield House, Hadfield Street, Manchester M16 9FE

Report Number: 530840-1

Date of Report: 11-Dec-2015

Customer: Southern Testing Laboratories
Keeble House
Stuart Way
East Grinstead
West Sussex
RH19 4QA

Customer Contact: Mr Chris Lennard

Customer Job Reference: J12448

Customer Purchase Order: J12448_1 Chris

Customer Site Reference: Land at Downlands, Isaacs Lane
(Haywards Heath)

Date Job Received at SAL: 03-Dec-2015

Date Analysis Started: 03-Dec-2015

Date Analysis Completed: 11-Dec-2015

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

This report should not be reproduced except in full without the written approval of the laboratory

Tests covered by this certificate were conducted in accordance with SAL SOPs

All results have been reviewed in accordance with Section 25 of the SAL Quality Manual



Report checked
and authorised by :
Claire Brown Crociquia
Customer Service Manager

Issued by :
Claire Brown Crociquia
Customer Service Manager



Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
Chromium VI	T6	A40	1	mg/kg	N	001-003
Fraction Organic Carbon - F(oc)	T21	A40	1	%	N	001-003
pH	T7	A40			M	001-003
Soil Organic Matter	T287	A40	0.1	%	N	001-003
(Water Soluble) SO4-- expressed as SO4	T242	A40	0.01	g/l	M	001-003
Sulphide	T4	A40	10	mg/kg	N	001-003
Cyanide(Total)	T4	AR	1	mg/kg	M	001-003
Phenols(Mono)	T221	AR	1.0	mg/kg	M	001-003
Moisture @105C	T162	AR	0.1	%	N	001-003
Retained on 2mm	T2	A40	0.1	%	N	001-003
Naphthalene	T16	AR	0.1	mg/kg	U	001-003
Acenaphthylene	T16	AR	0.1	mg/kg	U	001-003
Acenaphthene	T16	AR	0.1	mg/kg	M	001-003
Fluorene	T16	AR	0.1	mg/kg	M	001-003
Phenanthrene	T16	AR	0.1	mg/kg	U	001-003
Anthracene	T16	AR	0.1	mg/kg	M	001-003
Fluoranthene	T16	AR	0.1	mg/kg	N	001-003
Pyrene	T16	AR	0.1	mg/kg	N	001-003
Benzo(a)Anthracene	T16	AR	0.1	mg/kg	M	001-003
Chrysene	T16	AR	0.1	mg/kg	M	001-003
Benzo(b)fluoranthene	T16	AR	0.1	mg/kg	U	001-003
Benzo(k)fluoranthene	T16	AR	0.1	mg/kg	N	001-003
Benzo(a)Pyrene	T16	AR	0.1	mg/kg	M	001-003
Indeno(123-cd)Pyrene	T16	AR	0.1	mg/kg	M	001-003
Dibenzo(ah)Anthracene	T16	AR	0.1	mg/kg	M	001-003
Benzo(ghi)Perylene	T16	AR	0.1	mg/kg	M	001-003
PAH(total)	T16	AR	0.1	mg/kg	U	001-003
TPH (C5-C6)	T54	AR	0.10	mg/kg	N	001-003
TPH (C6-C8)	T54	AR	0.10	mg/kg	N	001-003
TPH (C8-C10)	T54	AR	0.10	mg/kg	N	001-003
TPH (C10-C12)	T219	AR	2	mg/kg	U	001-003
TPH (C12-C16)	T219	AR	2	mg/kg	U	001-003
TPH (C16-C21)	T219	AR	2	mg/kg	U	001-003
TPH (C21-C35)	T219	AR	2	mg/kg	U	001-003
TPH (C35-C40)	T219	AR	2	mg/kg	N	001-003



APPENDIX B

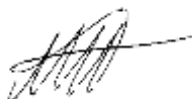
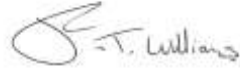
GROUND & WATER GI

REPORT

Phase II Site Investigation Report

Downlands Park, Issacs Lane, Haywards Heath, West Sussex RH16 4BQ

On behalf of Four Quarters Developments Limited c/o Symmetrys

Report Reference: GWPR4765/SIR/June 2022			Status: Final
Issue	Prepared By	Checked By	Verified By
v.1.01			
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EXECUTIVE SUMMARY	
PROPOSED DEVELOPMENT	At the time of reporting, June 2022, the proposed development was understood to comprise the erection of part two, part three and part four storey building comprising 70 extra care apartments with community hub, guest suite and staff facilities together with 15 extra care cottages (85 in total), pavilion, parking and access to form a Continuing Care Retirement Community following demolition of existing care home. Additional highways information received 28th January 2021 (Amended plans received 9th March showing a revised design and a reduction in the number of proposed units to 81).
GEOLOGY AND HYDROGEOLOGY	The site was underlain by bedrock deposits of the Upper Tunbridge Wells Sand Formation. No superficial deposits or areas of Made Ground or Reworked Ground were noted within a 250m radius. The site was underlain by a Secondary (Undifferentiated) Aquifer comprising the bedrock deposits of the Upper Tunbridge Wells Sand Formation. The site did not fall within a Groundwater Source Protection Zone (SPZ) as classified in the Policy and Practice for the Protection of Groundwater. No surface water features were present within a 250m radius of the site.
VOLUME CHANGE POTENTIAL	The cohesive soils of the Upper Tunbridge Wells Sand Formation were shown to have a medium to high volume change potential in accordance with BRE240 and non plastic to high volume change potential in accordance with NHBC Standards Chapter 4.2. The single sample of the granular soils tested had a volume change potential in accordance with BRE240 and NHBC Chapter 4.2.
FOUNDATION DESIGN	Foundations should be taken through the Topsoil/Made Ground and into the underlying the Upper Tunbridge Wells Sand Formation. Details are presented in section 6.2. Should higher bearing capacities be required or the influence of trees extend foundations below 2.50m bgl, then piled foundations may be more appropriate.
SUB-SURFACE CONCRETE	According to BRE Special Digest 1, 2005, 'Concrete in Aggressive Ground' a Sulphate Design Class of DS-1 could be used for sub-surface concrete in contact with the soils beneath the site. Table C1 of the Digest indicated an ACEC (Aggressive Chemical Environment for Concrete) classification of AC-1.
CONTAMINATION	Based on the results of the intrusive works, chemical analyses and risk assessments undertaken, no significantly elevated levels of determinants which pose an unacceptable risk to end-users for a ' <i>Residential without homegrown produce</i> ' land-use scenario and no remedial measures are required
GROUND-GAS	Based soil analysis, the site falls into the CS1 classification.

1. INTRODUCTION

1.1. General

Ground and Water Limited were instructed by Four Quarters Developments Limited c/o Symmetrys on the 19th April 2022 to conduct a Phase II Ground Investigation on the site at Downlands Park, Issacs Lane, Haywards Heath, West Sussex RH16 4BQ. The scope of the investigation was detailed within the fee proposal GW-0735, dated the 13th April 2022.

1.2. Aims of the Investigation

The aim of this report was to supply the client and their designers with information regarding the ground conditions underlying the site to assist them in preparing an appropriate scheme for development.

The investigation was to be undertaken to provide parameters for the design of foundations by means of in-situ and laboratory geotechnical testing undertaken on soil samples recovered from trial holes.

A contamination assessment was to be undertaken following chemical laboratory testing on soil samples recovered from the site to enable recommendations for the safe redevelopment of the site and the protection of site workers, end-users and the public from any potential contamination identified. The assessment comprise a Tier 2 Generic Quantitative Risk Assessment, under LCRM, with the intention of discharging any relevant planning condition.

This Site Investigation Report must be read in conjunction with the Desk Study Report referenced GWPR4765/DS/June 2022.

The techniques adopted for the investigation were chosen considering the requirements of the client, anticipated ground conditions, and bearing in mind the nature of the site, limitations to site access and other logistical limitations.

1.3. Conditions and Limitations

This report has been prepared based on the terms, conditions and limitations outlined within Appendix A.

1.4. Technical Glossary

Generic technical terms and their description can be viewed within the glossary provided within Appendix B.

2. SITE SETTING

2.1. Site Location

The site comprised a 2.2ha irregular located on the southern side of Issacs Lane. The site was located on the western edge of Haywards Heath, West Sussex.

The national grid reference/Easting Northing for the centre of the site was approximately TQ 32054 23738. A site location plan is given within Figure 1.

2.2. Site Description

A Site Walkover was undertaken during April 2022. A description of the site, as noted during the Site Walkover, is tabulated below.

Site Description Sheet	
Use of site	At the time of the Site Walkover, April 2022, the site was occupied by the buildings and grounds of a former care home.
Site topography	In general, the site sloped down towards the south-west at approximately 3-10°.
Area topography	Regionally, the site was at the crest of a slight ridge with gentle slopes down both towards the north and towards the south.
Structures on-site	The northern portion of the site was occupied by a two/three storey brick built structure with two storey and single storey extensions to the east, north and west of the main structure.
Structures off-site	Two storey residential properties were located to the north/north-east and south of the site.
Use of surrounding ground	Residential properties were located to the north/north-east and south of the site. A miniature railway was located to the east of the site with parkland to the west.
Boundary features	Various boundary features were noted around the large perimeter of the site comprising woodland, wooden fences, metal railings and an ~5m high brick wall was noted on the northern boundary.
Site covering	The majority of the site was covered with grass covered soft landscaping with tarmac hardstanding noted in the north-west corner and in the northern portion of the site.
Contamination sources on-site	A boiler house was noted on the northern side of the main structure.
Contamination sources off-site	None noted.
Vegetation on-site	~5 – 25m mature to semi-mature trees were noted along the north-western and south-western boundaries and dividing the majority of the soft landscaped area and the extreme eastern portion of the site.
Vegetation off-site	Numerous trees and bushes were noted in the gardens of neighbouring properties. Trees were noted in the open parkland to the west of the site.
Services	Drainage and soakaways were noted across the soft landscaped southern portion of the site. Water, gas and electricity services were noted in the northern portion of the site near the main structure.

2.3. Proposed Development

At the time of reporting, June 2022, the proposed development was understood to comprise the erection of part two, part three and part four storey building comprising 70 extra care apartments with community hub, guest suite and staff facilities together with 15 extra care cottages (85 in total), pavilion, parking and access to form a Continuing Care Retirement Community following demolition of existing care home. Additional highways information received 28th January 2021 (Amended plans received 9th March showing a revised design and a reduction in the number of proposed units to 81).

The proposed development fell within Geotechnical Design Category 2 in accordance with Eurocode 7. The proposed development plan can be seen within Figure 2.

2.4. Geology

The British Geological Survey Solid and Drift Geology Map for the Haywards Heath area (Horsham Sheet No. 302) revealed that the site was underlain by bedrock deposits of the Upper Tunbridge Wells Sand Formation. No superficial deposits or areas of Made Ground or Reworked Ground were noted within a 250m radius.

Superficial deposits (Drift) are the youngest geological deposits formed during the most recent period of geological time. They rest on older deposits or rocks referred to as bedrock (Solid), which are the main mass forming the Earth. Bedrock is present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

Upper Tunbridge Wells Sand Formation

The Upper Tunbridge Wells Sand Formation consists of variegated soft mudstone, silt, thinly bedded sandstone and occasional clay ironstone. The clay bands usually weather to red and the silts to mottled grey and orange.

Three BGS borehole records are available for three deep borehole soakaway installations located on the southern boundary of the site. They were drilled to a depth of between 6.00 – 61.00m bgl and revealed sand and clay to a depth of ~5.00 – 7.00m bgl overlying interbedded sandstones, siltstone and mudstone for the remaining depth of each of the boreholes

2.5. Hydrogeology and Hydrology

A study of the aquifer maps on the DEFRA website revealed the site was underlain by a **Secondary (Undifferentiated) Aquifer** comprising the bedrock deposits of the Upper Tunbridge Wells Sand Formation. No designation was given for superficial deposits due to their likely absence.

Examination of the Environment Agency records showed that the site **did not** fall within a Groundwater Source Protection Zone (SPZ) as classified in the Policy and Practice for the Protection of Groundwater.

No surface water features were present within a 250m radius of the site.

From analysis of hydrogeological and topographical maps the actual groundwater table was anticipated to be encountered at depth within the Upper Tunbridge Wells Sand Formation. Some amounts of groundwater however may be present at shallower depths within Made Ground or silty/sandy pockets of the Upper Tunbridge Wells Sand Formation. It was considered that groundwater was flowing in a westerly direction toward in line with local topography.

Examination of the Environment Agency records showed that the site was located within a Flood Zone 1, i.e. an area with a very low probability of flooding.

2.6. Radon

BRE 211 (2015) Map 5 of the London, Sussex and west Kent area indicated that the site **was not** located within an area where mandatory protection measures against the ingress of radon were likely to be required.

A review of the freely available Public Health England radon database, UK Radon, indicated that the site was located within a 1km grid square, where the maximum radon potential of <1% was recorded. Basic radon protection measures are required in areas where more than 3% of houses are at or above the Action Level.

The site was in an area where a risk assessment was not required.

2.7. Internet Search (Site Setting)

2.7.1. Available Unexploded Ordnance (UXO) Map Review

A review of the data available on www.zeticauxo.com/ revealed the site was located within a low-risk area associated with unexploded ordnance (UXO), as indicated by having <15 bombs dropped per 1000 acres. No known Luftwaffe Bombing Target sites were located in a close proximity to the site.

2.7.2. Historical Landfill Tool Review

A review of the data available on www.groundsure.io/ revealed no areas of Historical Landfilling in a close proximity to the site.

2.8. Preliminary Risk Assessment

The tabulated Conceptual Site Model developed as part of the Ground and Water Ltd Desk Study (GWPR4765/DS/June 2022) is outlined overleaf. For ease of reference and understanding, the risks have been classified within this risk assessment against four possible levels / categories, summarised in the table below. Any risk deemed to be negligible within the Preliminary Risk Assessment have been excluded from this report.

Risk Categories used in the Tabulated CSM	
Low Risk	Regarding this potential SPR linkage, the site is considered suitable for the proposed end-use and there is not considered to be an unacceptable risk to receptors. However, it is considered that further investigation to confirm this is recommended.
Moderate Risk	Regarding this potential SPR linkage, the site may not be suitable for the proposed end-use in its current condition and there may be an unacceptable risk to receptors. Further investigation is required to confirm this.
High Risk	Regarding this potential SPR linkage, the site is probably or certainly not suitable for proposed end-use and there is likely to be an unacceptable risk to receptors. Contaminants probably or certainly present and urgent action required in the short term.

Tabulated Conceptual Site Model – Pollutant Linkage Summary			(On-Site Sources)
Potential Sources	Potential Absorption Pathways	Potential Receptors	Risk Classification
Made Ground from construction activities: - Asbestos, - PAHs, - TPHs, - VOCs, - Sulphates, and - Metals.	- Direct ingestion of soil and soil derived dust - Dermal contact of soil and soil derived dust - Inhalation of dust (indoors and outdoors) with elevated concentration of determinands - Ingestion of home-grown produce, and soils attached - Direct ingestion of groundwater - Inhalation of volatile vapour (indoors and outdoors)	Human Health - End Users (Residents/Future site visitors) - Construction workers during development - Site operatives during maintenance works - Neighbours and public	Moderate
	- Direct uptake of groundwater - Direct uptake of determinands in the soil	Flora and Fauna Vegetation within soft landscaped areas	Moderate
	- Anthropogenic (man-made) pathways - Vertical and lateral migration in permeable strata - Surface water runoff	Controlled Waters Secondary A Aquifer (Upper Tunbridge Wells Sand Formation).	Low
Aggressive ground conditions with Made Ground and natural ground, including groundwater: - Sulphates, - PAH/TPH.	Direct contact with aggressive ground conditions	Building Materials and Services - Buried Concrete - Underground services (water pipes)	Moderate
Ground gases generated by Made Ground: - Methane, - Carbon Dioxide, - Hydrogen Sulphide, and - Carbon Monoxide.	- Migration through anthropogenic & natural pathways - Inhalation of Asphyxiating gases - Explosion (methane only)	Human Health - End Users (Residents/Future site visitors) - Construction workers during development (especially in confined spaces) - Site operatives during maintenance works in confined spaces - Neighbours and public	Low
	- Migration through anthropogenic & natural pathways - Explosion (methane only)	Building Materials and Services - Buildings - Confined spaces - Underground services	Low

3. SITE WORKS

3.1. Scope of Works

Site works were undertaken in several stages.

Phase I was undertaken between 29th April and 3rd May 2022, four Rotary Cored Boreholes were drilled to a depth of between 15m bgl (BH1, BH2 and BH4) and 25m bgl (BH3). Standard Penetration Tests were carried out at 1.50m intervals in each of the boreholes.

Phase II was undertaken on the 10th May 2022 and comprised the drilling of 3No. Windowless Sampler Boreholes (WS1 – WS3) to a depth of between 1.50m and 3.00m bgl. Standard Penetration Tests were carried out at 1.00m intervals within the boreholes. In addition, a trial pit foundation exposure (TP1) was hand excavated to a depth of 1.20m bgl to enable the measurement of the shape and configuration of the foundations to the wall on the northern boundary of the site.

Phase III was undertaken on the 12th May 2022 and comprised the machine excavation of 7No trial pits to a depth of between 1.35m and 2.30m bgl.

Combined ground-gas/groundwater monitoring standpipes, with an internal diameter of 50mm, were installed in BH1, BH4 and WS1 – WS3. The installation details can be viewed within the table below.

Combined Ground-gas and Groundwater Monitoring Well Construction					
Trial Hole	Depth of Installation (m bgl)	Thickness of slotted piping with gravel filter pack (m)	Depth of plain piping with bentonite seal (m bgl)	Response Zone (m bgl)	Piping internal diameter (mm)
BH1	15.00	14.00	1.00	1.00 – 15.00	50
BH4	15.00	14.00	1.00	1.00 – 15.00	50
WS1	3.00	2.00	1.00	1.00 – 3.00	50
WS2	1.50	1.00	0.50	0.50 – 1.50	50
WS3	1.50	1.00	0.50	0.50 – 1.50	50

The location of the trial hole locations can be seen within Figure 3.

Prior to commencing the ground investigation, a walkover survey was carried out to identify the presence of underground services and drainage. Where underground services/drainage were suspected and/or positively identified, the exploratory position was relocated away from these areas.

As a further precautionary measure, the borehole was hand excavated to 1.20m below the local ground level (bgl) and scanned with a Cable Avoidance Tool (CAT scanner) to minimise the risk to services.

Upon completion of the drilling works, the trial holes were backfilled and made good, in relation to the surrounding area.

3.2. Sampling Procedures

Small disturbed samples and environmental samples were recovered from the trial holes at the depths shown on the trial hole records. Soil samples were generally retrieved from each change of strata and/or at specific areas of concern. Samples were also taken at approximately 0.5m intervals during broad homogenous soil horizons.

A selection of samples were despatched to a laboratory for both geotechnical and chemical testing purposes.

4. ENCOUNTERED GROUND CONDITIONS

4.1. Soil Conditions

The trial holes were logged by a Ground and Water Limited representative, generally in accordance with BS EN 14688 'Geotechnical Investigation and Testing – Identification and Classification of Soil'. Any rock or weathered rock samples were logged in accordance with BS EN 14689 'Geotechnical Investigation and Testing – Identification and Classification of Rock'.

The ground conditions encountered within the trial holes constructed on the site did generally conform to that anticipated from examination of the geology map. A capping of topsoil/Made Ground was noted to overlie the bedrock deposits of the Upper Tunbridge Wells Sand Formation.

The succession of conditions and description of soils encountered in the trial holes in descending order is tabulated below.

Summary of Strata Encountered (BH01 – BH02)			
Strata	Top Depth (m bgl)	Base Depth (m bgl)	Thickness (m)
TOPSOIL (BH1 – BH4, WS2 – WS3, TP1 – TP8): Pale brown slightly gravelly fine SAND to brown sandy CLAY. The gravel was sub-angular to sub-rounded, fine to medium sandstone.	GL	0.20 – 0.45	0.20 – 0.45
MADE GROUND (WS1, TP2): Brown gravelly clayey fine to medium SAND to sandy CLAY. The gravel was sub-angular to sub-rounded, fine to coarse sandstone, flint and brick. To see the percentage of various fragments within the Made Ground, please refer to logs found within Appendix C.	GL – 0.15	0.30 – 0.70	0.30 – 0.55
MADE GROUND (TP6 only): Brown clayey GRAVEL. The gravel was sub-angular, fine to coarse brick and concrete. To see the percentage of various fragments within the Made Ground, please refer to logs found within Appendix C.	0.20	0.95	0.75
UPPER TUNBRIDGE WELLS SAND FORMATION : Variable deposits ranging from a pale grey and orange brown mottled silty CLAY with pockets of orange silt to orange slightly gravelly to gravelly SAND. The sand was fine to medium and the gravel sub-angular, fine to medium flint. brown to grey slightly gravelly CLAY. Gravel is sub-angular to sub-rounded, fine to medium flint.	0.20 – 0.95	1.20 – 4.60	>0.70 – 3.75
UPPER TUNBRIDGE WELLS SAND FORMATION (BH1 – BH4 only): Interbedded pale grey and pale orange SANDSTONE, SILTSTONE and occasional dark grey MUDSTONE	3.50 – 4.10	>15.00 – >25.00	>11.50 – >21.90

For details of the composition of the soils encountered at particular points, reference must be made to the individual trial hole logs within Appendix D of this report. A trial hole location plan can also be viewed within Figure 3.

4.2. Foundation Exposures

The hand excavation of 1No. Foundation Exposure (TP1) was undertaken on the brick wall on the northern boundary of the site across the site. A tabulated summary showing the depth and width of each foundation can be viewed below, as well as the bearing stratum. A photograph of the foundation exposure can be viewed within Figure 4.

Summary of Foundations Encountered			
Trial Hole	Depth of Foundation (m bgl)	Width at the Base of Foundation (mm)	Bearing Stratum
TP1 (boundary wall)	>1.20m	Does not step out	Assumed Upper Tunbridge Wells Sand Formation

4.3. Roots Encountered

Roots were noted in each of the trial holes to a depth of between 0.19 – 110m bgl..

A summary of the depth of root penetration can be viewed below.

Root Depth	
Trial Hole	Fresh Root Penetration (m bgl)
BH1	0.30
BH2	0.80
BH3	0.30
BH4	0.30
WS1	0.60
WS2	0.40
WS3	0.40
TP1	1.10
TP2	0.70
TP3	0.70
TP4	0.65
TP5	0.72
TP6	0.19
TP7	0.26
TP8	0.80

It must be noted that the chance of determining actual depth of root penetration through a narrow diameter borehole is low. Roots may be found to greater depths at other locations on the site, particularly close to trees and/or trees that have been removed both within the site and its close environs.

4.4. Groundwater Conditions

Groundwater was not encountered in the boreholes and the trial pits. It should be noted that groundwater strikes may be obscured by the drilling process.

Changes in groundwater level occur for a number of reasons including seasonal effects and variations in drainage. The investigation was undertaken in April and May 2022 when groundwater levels are likely to be approaching their annual minimum (lowest elevation). Exact groundwater levels may only be determined through long term measurements from monitoring wells installed on-site.

4.5. Obstructions

The density/stiffness of the soils prevented further progress of WS1 below 3.00m bgl and WS2 – WS3 below 1.50m bgl. No other artificial or natural sub-surface obstructions were noted during construction of the trial holes.

5. IN-SITU AND LABORATORY TESTING

5.1. In-situ Strength Testing

Standard Penetration Tests (SPTs) were undertaken as part of the site investigation. The results of the SPT's have not been amended to consider hammer efficiency, rod lengths and overburden pressure in accordance with Eurocode 7. The test results are presented on the borehole logs within Appendix C. An interpretation of the in-situ geotechnical testing results is given in the table below.

Interpretation of In-situ Geotechnical Testing Results					
Strata	SPT "N" Blow Counts	Equivalent Undrained Shear Strength (Cu) (kPa) (Stroud (1974))	Soil Type		Trial Hole/s
			Granular (Density)	Cohesive (Cu)	
Upper Tunbridge Wells Sand Formation (Granular)	22 – 53	-	Medium Dense – V Dense	-	WS1/0.30 – 3.00
Upper Tunbridge Wells Sand Formation (Cohesive)	>50	>250	-	V High Cu	BH1/0.30 – 3.60
	>50	>250	-	V High Cu	BH2/0.30 – 3.20
	15 - >50	75 - >250	-	High - V High Cu	BH3/0.35 – 4.10
	>50	>250	-	V High Cu	BH4/0.40 – 3.80

It must be noted that field measurements of undrained shear strength (Cu) are dependent on a number of variables including disturbance of sample, method of investigation and also the size of specimen or test zone.

5.2. Geotechnical Laboratory Testing

A programme of geotechnical laboratory testing, scheduled by Ground and Water Limited and carried out by an accredited geotechnical testing laboratory was undertaken on samples recovered. Details of the specific tests used in each case are given below.

Standard Methodology for Laboratory Geotechnical Testing		
Test	Standard	Number of Tests
Atterberg Limit Tests	BS1377:2016:Part 2:Clauses 3.2, 4.3 & 5	7
Particle Size Distribution Tests	BS1377:2016:Part 2:Clause 9	1
BRE Special Digest 1 Tests	BRE Special Digest 1 "Concrete in Aggressive Ground (BRE, 2005).	2

5.2.1. Atterberg Limit Testing

A précis of Atterberg limit testing undertaken can be seen tabulated overpage. The test results are presented within Appendix D.

Atterberg Limit Tests Results Summary							
Stratum	Moisture Content (%)	Passing 425 µm sieve (%)	Modified PI (%)	Soil Class	Consistency Index (Ic)	Volume Change Potential	
						BRE	NHBC
Upper Tunbridge Wells Sand Formation	98 – 25	80 – 100	21 - 42	CL – CH	Stiff	Medium - High	NP, Medium – High
- NP – Non-plastic - BRE Volume Change Potential refers to BRE Digest 240 (based on Atterberg results) - Soil Classification based on British Soil Classification System. - Consistency Index (Ic) based on BS EN ISO 14688-2:2018.							

5.2.2. Moisture Deficit Assessment

The results of the Atterberg Limit tests were analysed to determine the Liquidity Index of the samples, to give an indication as to whether the samples recovered showed a moisture deficit as well assessing their degree of consolidation. Liquid Limit analyses was undertaken to assess whether there were any potentially significant moisture deficits within the samples tested.

A potential moisture deficit, caused by lithology, was noted within BH2 at 2.50m bgl, TP3 at 1.00m bgl and TP6/1.20m bgl.

5.2.3. Particle Size Distribution Testing

The results of particle size distribution (PSD) testing undertaken show that the one sample tested from TP7/1.00m bgl has a volume change potential in accordance with BRE240 and NHBC Standards Chapter 4.2. The results of the PSD testing can be viewed within Appendix E and summarised below.

Atterberg Limit Tests Results Summary			
Stratum	Range Passing 63µm Sieve (%)	Volume Change Potential	
		BRE	NHBC
Upper Tunbridge Wells Sand Formation	62	Yes	Yes
- Volume Change Potential refers to BRE Digest 240 (based on Grading test results). - Shrinkability refers to NHBC Standards Chapter 4.2 (based on Grading test results). - BRE 240 states that a soil has a volume change potential when the clay fraction exceeds 15%. Only the silt and clay combined fraction are determined by sieving therefore the volume change potential is estimated from the percentage passing the 63µm sieve. - NHBC Standards Chapter 4.2 states that a soil is shrinkable if the percentage of silt and clay passing the 63µm sieve is greater than 35% and the Plasticity Index is greater than 10%.			

5.2.4. BRE Special Digest 1 Testing

In accordance with BRE Special Digest 1 'Concrete in Aggressive Ground' (BRE, 2005), samples were scheduled for laboratory analysis to determine parameters for concrete specification. The results of the chemical analysis undertaken are given within Appendix D and a summary is tabulated overpage.

Summary of BRE Special Digest 1 Testing Results			
Determinand	Unit	Upper Tunbridge Wells Sand Formation (minimum)	Upper Tunbridge Wells Sand Formation (maximum)
pH	-	7.8	7.9
Total Sulphate as SO ₄	%	0.09	0.03
Water Soluble Sulphate as SO ₄	mg/l	276	79
Total Sulphur	%	0.03	<0.02
Ammonium as NH ₄	mg/l	0.37	0.89
Water Soluble Chloride (2:1)	mg/l	7.6	20.1
Water Soluble Nitrate (2:1) as NO ₃	mg/l	<1.5	<1.5
Water Soluble Magnesium	mg/l	2.4	5.2

6. ENGINEERING CONSIDERATIONS

6.1. Soil Characteristics and Foundation Considerations

A summary of the soil characteristics following the intrusive site investigation and laboratory testing and the relevant foundation considerations has been provided below. The following information from the ground investigation was considered pertinent to the design of foundations.

- Foundations should be taken through any Made Ground/Topsoil and either into, or onto a suitable underlying natural stratum of adequate bearing characteristics.
- Foundations should be designed in accordance with soils of high volume change potential.
- Given the presence of cohesive soils at shallow depth, special foundation precautions may be required to prevent possible future shrinkage/swelling of the soils affecting the integrity of the faces of foundations (underfloor void diameter/compressible material/void formers etc.). A compressible layer must be provided to accommodate potential seasonal movement, based on NHBC guidance.
- In case of piling, the design of each structural element (slab/piles/beams) should be designed in accordance with the appropriate volume change potential of the respective bearing stratum.
- The loads of proposed foundations should not exceed the allowable bearing capacity of the soils they are founding upon.
- Care should be taken not to overdig foundations as this may stress underlying soft spots, should they be present.
- Foundations must not be placed within fresh root penetrated and/or desiccated soils with volume change potential. It is recommended that foundations are taken at least 300mm into non-fresh root penetrated strata if the soils have volume change potential, or into soils of no volume change potential.
- The influence of trees on or surrounding the site will need to be taken into account in final design (NHBC Standards Chapter 4. 2) (tree rings).
- Any water ingress must be prevented from entering foundation trenches and excavations must be kept dry and either concreted or blinded as soon after excavation as possible. If water were allowed to accumulate within the excavation for even a short period of time, an increase in heave occur. The shear strength will also be reduced, resulting in lower bearing capacities, resulting in increased settlements. Instability issues may arise within the foundation trenches, in case of perched water being present.

Based on the previous section, foundations should bypass any Made Ground/Topsoil before extending 300mm below the proved depth of root penetration. Foundations would therefore be constructed on competent, moisture stable soils of the Upper Tunbridge Wells Sand Formation. Tabulated summaries showing the minimum foundation depth for the main structure and the cottages at the eastern end of the site and based on each trial hole can be viewed below. **The influence of nearby trees may require deeper foundations. Tree ring calculations are needed for final design and final depths.**

Minimum foundation depths for the main structure are shown overpage:

Summary of Minimum Foundation Depths			
Trial Hole	Minimum Foundation Depth (m bgl)	Founding Geological Formation	Reason
BH1	1.00	Upper Tunbridge Wells Sand Formation	Foundations should bypass any Topsoil or Made Ground and extend 300mm below the depth of root penetration before founding on competent soils at a moisture stable depth.
BH2	1.00		
BH3	1.00		
WS1	1.00		
WS2	1.00		
TP3	1.00		
TP6	1.00		
TP7	1.00		
TP8	1.00		

Minimum foundation depths for the cottages at the eastern end of the site are shown below:

Summary of Minimum Foundation Depths			
Trial Hole	Minimum Foundation Depth (m bgl)	Founding Geological Formation	Reason
BH4	1.00	Upper Tunbridge Wells Sand Formation	Foundations should bypass any Topsoil or Made Ground and extend 300mm below the depth of root penetration before founding on competent soils at a moisture stable depth.
WS3	1.00		
TP2	1.00		
TP4	1.00		
TP5	1.00		

6.2. Shallow Foundations

At the time of reporting, June 2022, the proposed development was understood to comprise the erection of part two, part three and part four storey building comprising 70 extra care apartments with community hub, guest suite and staff facilities together with 15 extra care cottages (85 in total), pavilion, parking and access to form a Continuing Care Retirement Community following demolition of existing care home. Additional highways information received 28th January 2021 (Amended plans received 9th March showing a revised design and a reduction in the number of proposed units to 81).

Foundations should be taken through the Topsoil or Made Ground and constructed on the Upper Tunbridge Wells Sand Formation at a depth of 1.00 – 1.50m bgl can be designed based on an allowable bearing capacity of ~220 - 300kN/m² with the strength generally increasing with depth. Based upon the varying ground conditions, it should be noted that bearing capacities generally vary at different depths and for different footing configurations. The allowable bearing capacity given above represents an average value based on an 'average' strength profile of the ground conditions encountered at the depths stated above and towards safety. It could be locally lower at different depths.

This is based on trial hole records, the results of in-situ testing, inspection of samples recovered, and based on a 5m long by 1m wide foundation and a maximum settlement of 25mm. Settlements on loading are likely to be moderate.

Differential settlement between foundations cast into the cohesive and granular soils is anticipated and foundations must be reinforced to allow for such potential differential movement, if they span

across materials of different consistency (granular/cohesive). Note should be made that differential settlement may also occur between strip and isolated pad foundations.

Additional Comments

A number of comments and recommendations has been provided below.

- It is prudent to avoid having a foundation spanning across materials of different consistency, like clay and gravel, in order to avoid potential differential settlements. If unavoidable, foundations must be reinforced to allow for such potential differential movement. It should be noted that differential settlement may also occur between strip and isolated pad foundations.
- Foundation excavations must be carefully bottomed out and any loose soil or soft spots removed prior to the foundation concrete or blinding being placed. Failure to ensure that foundation excavations are suitably bottomed out could result in additional settlements.
- Inspection of foundation excavations, prior to concreting, must be made by a competent and suitably qualified person to check for soft spots and to check for the presence of roots.
- Foundations must not be cast over foundations of former structures and/or other hard spots.
- Given soils of volume change potential were encountered and Topsoil/Made Ground was noted to be deeper than 0.60m bgl, a suspended slab is required.
- Isolated Pad Foundations must be at least 1.5 times the width of the widest pad apart to keep to the anticipated settlements.
- Final designs for the foundations should be carried out by a suitably qualified Engineer based on the findings of this investigation and with reference to the anticipated loadings, serviceability requirements for the structure and the developments proximity to former, present, and proposed trees. Where trees are mentioned in the text this means existing trees, recently removed trees (approximately 15 years to full recovery on cohesive soils) and those planned as part of the site landscaping.

6.3. Piled Foundation

Based on the results of the intrusive investigation, a piled foundation scheme was unlikely to be required, unless minipiles are chosen.

6.4. Excavations and Stability

Shallow excavations in any Made Ground and are likely to be marginally stable at best. Long, deep excavations, through the London clay Formation are also likely to become unstable.

The excavations must not affect the integrity of the adjacent structures beyond the boundaries. The excavations must be supported by suitably designed retaining walls. The retaining walls will need to be constructed based on soils encountered with an appropriate angle of shear resistance (ϕ') and effective cohesion (C') for the ground conditions encountered, regarding long term considerations, as well using an appropriate undrained shear strength C_u for short term considerations in cohesive units.

A shallow thickness of granular and cohesive Made Ground was encountered to a maximum depth of 0.95m bgl.

Based on the ground conditions encountered the following characteristic soil parameters could be used in the design of retaining walls. These have been designed based on the SPT profile recorded, results of geotechnical classification tests and reference to literature.

Retaining Wall/Basement Characteristic Parameters for Design – Long term cohesive / granular					
Strata	Unit Volume Weight (kN/m ³)	Cohesion Intercept (c') (kPa)	Angle of Shearing Resistance (ϕ'_{cv} / ϕ'_{pk})	Ka (Rankine)	Kp (Rankine)
Made Ground (granular)	~17	0	15°	0.59	1.70
Made Ground (cohesive)	~18	0	12°	0.66	1.52
Upper Tunbridge Wells Sand Formation (cohesive)	~20	0	24 (ϕ'_{cv})	0.42	2.37
Upper Tunbridge Wells Sand Formation (granular)	~20	0	35 - 40	0.22 – 0.27	3.69 – 4.60

ϕ'_{cv} = constant volume angle of shearing resistance (or critical state)

According to the findings of the ground investigation, the lower ground floor will be constructed within the cohesive upper soils of the Tunbridge Wells Sand Formation.

Considering the fact that the lower ground floor will be mainly constructed within cohesive soils, undrained conditions should also be considered in the design.

Groundwater was not encountered during the intrusive investigation.

It should be noted that the Ka and Kp values presented in the table, are shown for guidance and they are derived from the Rankine theory for soil pressures. The values for angles of shearing resistance provided are considered to be characteristic values of the soils encountered.

According to CIRIA C760, a design method (e.g. EC7) should be adopted and followed through the whole design process.

In addition, the following considerations should be taken into account during the design process:

- Allowance for 0.5m to 1.0m over-excavation in front of the wall.
- Appropriate consideration of groundwater levels.
- Surcharge pressure equivalent to the pressures of any adjacent buildings.
- Surcharge pressures from potential piling work platforms and heavy plant traffic.

Unsupported earth faces formed during excavation may be liable to collapse without warning and suitable safety precautions should therefore be taken to ensure that such earth faces are adequately supported before excavations are entered by personnel.

6.5. Sub-Surface Concrete Design

Concrete to be placed in contact with soil or groundwater must be designed in accordance with the recommendations of Building Research Establishment Special Digest 1, 2005, *'Concrete in Aggressive*

Ground' considering the pH of the soils. For the classification given below, the “mobile” and “natural” case was adopted given the geology encountered and the residential use of the site.

Topsoil

The water-soluble sulphates in the Topsoil were noted to be 11 - 29mg/l, with a pH of 6.4 – 8.4, from chemical laboratory testing.

Made Ground

The water-soluble sulphates in the Made Ground were noted to be 16 - 27mg/l, with a pH of 7.6 – 8.1, from chemical laboratory testing.

Upper Tunbridge Wells Sand Formation

The water-soluble sulphates in the Upper Tunbridge Wells Sand Formation were noted to be 24 - 29mg/l, with a pH of 7.0 - 7.6, from chemical laboratory testing. The total potential sulphate (3x total sulphur) was <0.06%, from chemical laboratory testing.

According to BRE Special Digest 1, 2005, ‘Concrete in Aggressive Ground’ a Sulphate Design Class of DS-1 could be used for sub-surface concrete in contact with the Upper Tunbridge Wells Sand Formation. Table C1 of the Digest indicated an ACEC (Aggressive Chemical Environment for Concrete) classification of AC-1.

6.6. Roads and Hardstanding Design

This section provides information relating to the construction of roads and hardstanding, for each strata encountered.

6.6.1. Anticipated CBR Values and Frost Susceptibility

Made Ground

Roads and hardstanding should not be constructed on Made Ground given its variability in composition and likely low strength/density. Where these cannot be bypassed a CBR value of 1% should be adopted for Made Ground. Given that Made Ground encountered beneath the site comprised a mixture of poorly drained clayey sandy gravel based soils, these deposits are likely to be **frost susceptible**.

Upper Tunbridge Wells Sand Formation

Roads and hardstanding constructed on the cohesive Upper Tunbridge Wells Sand Formation should be designed based on a CBR value of 4.0%. This is based on reference to Table C1 of TRL1132 and average construction conditions. Based on wet conditions a CBR of 2.5% should be adopted, with dry conditions a CBR of 4.5% being applicable. These clay-based soils are likely to be frost susceptible.

All formation levels for roads and hardstanding should be proof rolled to highlight any soft areas which should then be dug out and replaced with selected granular material compacted in thin layers to a suitable specification.

6.6.2. In-Situ California Bearing Ratio Tests by Dynamic Cone Penetrometer

In-situ California Bearing Ratio (CBR) testing by dynamic cone penetrometer (DCP) was undertaken to determine the CBR values of the soils underlying the site to shallow depth in accordance with BS1377

Part 9: 2016: 4.3 and a summary of the results is tabulated overpage. The test results are presented in Appendix B.

In-situ CBR Test Results Summary										
Test Location	Layer 1 (Made Ground/Topsoil)		Layer 2 (Made Ground/Topsoil)		Layer 3 (Made Ground/Topsoil)		Layer 4 (UTWSF)		Layer 5 (UTWSF)	
	Thickness (mm)	In-situ CBR (%)	Thickness (mm)	In-situ CBR (%)	Thickness (mm)	In-situ CBR (%)	Thickness (mm)	In-situ CBR (%)	Thickness (mm)	In-situ CBR (%)
DCP1	625mm	10%	-	-	-	-	240	15%	-	-
DCP2	105mm	5%	50mm	10%	323mm	13%	107mm	4%	319mm	8%
DCP3	140mm	17%	461mm	7%	-	-	298mm	40%	-	-
DCP4	228mm	15%	79mm	6%	224mm	5%	258mm	11%	93mm	23%

*UTWSF – Upper Tunbridge Wells Sand Formation

6.7. Surface Water Disposal

Soakaway testing in accordance with BRE365 in trial pits was beyond the scope of this investigation.

A falling head was undertaken in BH3 at a depth of 25m bgl. However, it was not possible to fill the borehole above a depth of 7m bgl and the water was noted to remain at that level for over 4 hours.

The Desk Study has revealed that there are currently three deep soakaways installed to a depth of 60 – 61m bgl close to the southern boundary of the site.

Any soakaways should be located sufficiently away from buildings and infrastructure, in order to prevent undermining of foundations.

The submission of a Sustainable Urban Drainage Scheme (SUDS) is likely to be required for this site due to the proposed development increasing the amounts of hardstanding.

Consultation with the Environment Agency must be sought regarding any use that may have an impact on groundwater resources, abstractions and surface water features/watercourses.

7. CONTAMINATION RISK ASSESSMENT

7.1. Results of the Preliminary Risk Assessment

The tabulated Conceptual Site Model (CSM) developed by the Ground and Water Desk Study (ref. GWPR4765/DS/June 2022) is reproduced in section 2.8. For the complete information please see the Desk Study report.

No additional source of contamination, pathway or receptor was identified between the desk study and the ground investigation and as such, it was not necessary to modify the CSM.

In the UK, the assessment of risk from contamination follows the source-pathway-receptor (SPR) approach. For a risk to be present there must be a source of contamination, a receptor or receptors, and a pathway for contaminants to migrate or be absorbed. If there is a linkage between any given source and receptor, then a quantitative risk assessment is used to assess the significance or impact of the pollutant linkage.

7.2. Sampling Locations

The synopsis for the trial hole locations and their final depth can be seen tabulated below. A trial hole location plan is provided within Figure 3. The table also indicates whether any locations targeted a source of contamination as well as the proposed end-use. The proposed development can be seen in Figure 2.

Trial Hole Location Synopsis		
Trial Hole/Final Depth	Sampling Strategy	Proposed End-Use
BH1/15.00m	Random	Footprint of Proposed Building
BH2/15.00m	Random	
BH3/25.00m	Random	
BH4/15.00m	Random	
WS1/3.00m	Random	Area of Hardstanding
WS2/1.50m	Random	Area of Soft Landscaping
WS3/1.50m	Random	Area of Hardstanding
TP1/1.20m	Random	
TP2/2.30m	Random	Footprint of Proposed Building
TP3/2.20m	Random	Area of Hardstanding
TP4/3.35m	Random	Footprint of Proposed Building
TP5/2.00m	Random	
TP6/2.10m	Random	Area of Soft Landscaping
TP7/1.90m	Random	
TP8/1.90m	Random	

The investigation area totals approximately 22,000m² and with fifteen sampling locations, given an unknown hotspot shape, the sampling density means that a hotspot with an area of approximately 2,200m² and a radius of approximately 26.5m would be encountered (CLR 4).

7.3. Soil Risk Assessment

Sampling depths were chosen to reflect the receptor of concern (e.g. human health, controlled waters and vegetation). No samples where olfactory or visual evidence of contamination were present. The remaining samples were scheduled under a random strategy. The receptors relevant to the sampling depths are tabulated below.

Summary of Receptors per Sample Depth	
Depth	Receptors
Shallow Samples (< 0.75m bgl)	• End Users (Residents/Future site visitors) • Construction workers during development • Site operatives during maintenance works • Neighbours and public • Vegetation within soft landscaped areas (shallow rooted) • Secondary A Aquifer (Upper Tunbridge Wells Sand Formation) • Buried Concrete • Receiving landfill
Moderate Samples (0.75 – 1.50m bgl)	• Construction workers during development • Site operatives during maintenance works • Vegetation within soft landscaped areas (deep rooted) • Secondary A Aquifer (Upper Tunbridge Wells Sand Formation) • Buried Concrete • Receiving landfill • Underground services (water pipes)

Chemical laboratory testing, scheduled by Ground and Water Limited, and carried out by ALS Environmental, was undertaken on three samples of Topsoil (TP3/0.20, TP4/0.20m and TP8/0.20m bgl) and two samples of Made Ground (TP2/0.20m and TP6/0.90m bgl). The samples were subjected to a combination of analysis that comprised:

- Asbestos screen;
- Semi-metals and heavy metals incl. Arsenic, Cadmium, Chromium (incl. Hexavalent Chromium), Copper, Lead, Mercury, Nickel, Selenium, Vanadium, Zinc;
- Polycyclic Aromatic Hydrocarbons (PAH's) incl. Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, Benzo(ghi)perylene;
- Speciated TPH including full aliphatic/aromatic split; and
- BTEX compounds (Benzene, Toluene, Ethylbenzene, Xylene) and MTBE – used as marker compounds for Volatile Organic Compounds (VOCs).

A breakdown of the number of tests undertaken for each determinand is discussed in further sections. The chemical laboratory results are presented in Appendix E.

7.3.1. Soil Assessment Criteria and Results

At the time of reporting, June 2022, the proposed development was understood to comprise the erection of part two, part three and part four storey building comprising 70 extra care apartments with community hub, guest suite and staff facilities together with 15 extra care cottages (85 in total), pavilion, parking and access to form a Continuing Care Retirement Community following demolition of existing care home. Additional highways information received 28th January 2021 (Amended plans received 9th March showing a revised design and a reduction in the number of proposed units to 81). Proposed site plans are provided as Figure 2.

Based on the proposed development, the results of the chemical laboratory testing were compared to the Generic Assessment Criteria (GAC) for a ***‘Residential without homegrown produce’*** land-use scenario, as this was considered the most appropriate land-use scenario.

Where a contaminant of concern’s GAC varies according to the Soil’s Organic Matter (SOM), the SOM recorded for each uncontaminated soil type was used to derive the appropriate GAC for each soil type. A SOM value of 1%, the most conservative value, was utilised.

A summary of the analytical results and the comparison to the determinands adopted screening value are presented in the table below and overleaf.

Soil Contamination Test Results and Screening Values					
Determinand	Number of Samples	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Adopted Screening Value (mg/kg)	Was the adopted screening value exceeded for relevant land-use scenario?
INORGANICS					
Asbestos	5			N/A	No
Cyanide (total)	5	<1	<1	24	No
Phenols	5	<0.035	<0.035	750	No
METALS					
Arsenic	5	6.98	17.6	40	No
Boron	5	<1	1.12	11000	No
Cadmium	5	<0.02	0.274	85	No
Chromium (III)	5	<0.9	11.1	910	No
Chromium (Hexavalent)	5	<0.6	<0.6	6	No
Copper	5	9.08	28	7100	No
Lead	5	20.1	102	310	No
Mercury	5	<0.1	<0.1	1.2	No
Nickel	5	6.8	12	180	No
Selenium	5	<1	2.55	430	No
Vanadium	5	20.1	32.4	1200	No
Zinc	5	33.2	108	40000	No
TOTAL PETROLEUM HYDROCARBONS (TPHs)					
Aliphatic >C5 - C6	2	<0.01	<0.01	42	No
Aliphatic >C6 - C8	2	<0.01	<0.01	100	No
Aliphatic >C8 - C10	2	<0.01	<0.01	27	No
Aliphatic >C10 - C12	2	<1	<1	130	No
Aliphatic >C12 - C16	2	<1	<1	1100	No
Aliphatic >C16 - C21	2	<1	1.77	65000	No
Aliphatic >C21 - C34	2	<1	1.46	65000	No
Aromatic >C5 - C7	2	<1	<1	370	No
Aromatic >C7 - C8	2	<0.01	<0.01	860	No
Aromatic >C8 - C10	2	<0.01	<0.01	47	No
Aromatic >C10 - C12	2	<0.01	<0.01	250	No
Aromatic >C12 - C16	2	<1	<1	1800	No
Aromatic >C16 - C21	2	<1	<1	1900	No
Aromatic >C21 - C35	2	<1	<1	1900	No
Benzene	3	<0.009	<0.009	0.38	No
Toluene	3	<0.007	<0.007	880	No

Ethylbenzene	3	<0.004	<0.004	83	No
m,p-Xylene	3	<0.01	<0.01	79	No
o-Xylene	3	<0.01	<0.01	370	No
POLYCYCLIC-AROMATIC HYDROCARBONS					
Acenaphthene	5	<0.008	<0.008	3000	No
Acenaphthylene	5	<0.012	0.0664	2900	No
Anthracene	5	<0.016	0.0347	31000	No
Benzo(a)anthracene	5	<0.014	0.572	11	No
Benzo(a)pyrene	5	<0.015	0.84	3.2	No
Benzo(b)fluoranthene	5	<0.015	0.915	3.9	No
Benzo(ghi)perylene	5	<0.024	0.548	360	No
Benzo(k)fluoranthene	5	<0.014	0.386	110	No
Chrysene	5	<0.01	0.468	30	No
Dibenzo(a,h)anthracene	5	<0.023	0.135	0.31	No
Fluoranthene	5	<0.017	0.646	1500	No
Fluorene	5	<0.01	<0.01	2800	No
Indeno(1,2,3-cd)pyrene	5	<0.018	0.71	45	No
Naphthalene	5	<0.009	0.0177	2.6	No
Phenanthrene	5	<0.015	0.119	1300	No
Pyrene	5	<0.015	0.639	3700	No
MARKER FOR VOLATILE ORGANIC COMPOUND					
Methyl tert-butyl ether (MTBE)	3	<0.01	<0.01	73	No
The derivation of the Soil Assessment Criteria used within this report can be seen within Appendix F. The soil concentrations were typically compared to the LQM/CIEH Suitable for Use Levels (S4UL) (2014), based upon the assumption of 1% soil organic matter. A screening value for Lead is based on the Category 4 Screening Levels (C4SLs). Where no S4UL or C4SL is available for Cyanide, a SoBRA acute GAC is assigned. Where no S4UL or C4SL is available for MTBE, a CL:AIRE 2010 GAC is assigned. Where exceedances are noted, the trial hole and depth of sample is recorded.					

The proposed development includes areas of soft-landscaping, where shallow rooted vegetation may be exposed to aggressive ground conditions. The previous table compares the results of the laboratory analysis to GAC that is protective of Human Health and therefore different GAC is required for vegetation.

Soil Contamination Test Results and Screening Value					
Determinand	Number of Samples	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Adopted Screening Value (mg/kg)	Was the adopted screening value exceeded for relevant land-use scenario?
Copper	5	9.08	28	250	No
Zinc	5	33.2	108	1,000	No
The derivation of the Soil Assessment Criteria used within this report can be seen within Appendix F. The soil concentrations were compared to the ICRL 70/90: <i>Notes on the restoration and aftercare of metalliferous mining sites for pasture and grazing</i> . Where exceedances are noted, the trial hole and depth of sample is recorded.					

7.3.2. Soil Assessment

The comparison between the laboratory analysis and the assessment criteria indicates that the determinands were identified at below their respective adopted screening values and are not considered to represent an unacceptable risk to future receptors and no mitigation is required.

Asbestos

No asbestos has been identified during the testing, however, an **Asbestos Management Strategy** should be put in place so that any potentially asbestos containing materials within the existing structures are identified and removed from site in a suitable manner to prevent cross-contamination.

7.3.3. Water Supply Pipe Risk Assessment

As part of the proposed development it is expected that new water supply pipes will be installed at the site. Water supply pipes have the potential to be exposed to contaminants in the ground that can lead to unacceptable concentrations within the drinking water. If a risk is identified, specialist pipes that are protective of the drinking water are required.

A pipe selection risk assessment should be submitted to the water supply company as part of the development based on the supplier's assessment criteria. An indication of whether there is likely to be a risk can be seen tabulated below, where the PE pipe thresholds are based on *UKWIR Contaminated Land Assessment Guidance, 2014*.

Pipe Selection Risk Assessment			
Determinand	PE Pipe Threshold (mg/kg)	Laboratory Analysis Range (mg/kg)	Was the Threshold Exceeded?
Total BTEX and MTBE	0.1	< 0.009 - <0.01	No
Total VOCs	0.5		No
Total SVOCs	2		No
Phenols	2	< 0.035	No
TPH EC5 – EC10 (aliphatics and aromatics)	2	< 0.01	No
TPH EC10 – EC16 (aliphatics and aromatics)	10	< 1	No
TPH EC16 – EC40 (aliphatics and aromatics)	500	< 1 – 1.77	No
Naphthalene	5	< 0.009 – 0.018	No

The results indicate that no determinands were above the threshold for the use of a PE pipe at the site.

7.4. Groundwater Risk Assessment

In the UK, the water environment is protected under a number of regulatory regimes, mainly governed by the Environment Agency. The Environment Agency is consulted when there may be a risk to Controlled Waters, or where a pollution incident has occurred historically. The Water Framework Directive is implemented in various guises covering groundwater, surface water and drinking water supply.

The soil samples analysed as part of the risk assessments in section 7.3 have been used to undertake a Level 1 (soils) Controlled Waters risk assessment. At Level 1 (soils), the conceptual site model and the determinand concentrations of the soils are used to indicate whether the concentrations are sufficient to impact the receptor. At this stage, dilution, dispersion and attenuation along the pathway are not considered.

A study of the aquifer maps on the Defra website revealed the site was underlain by a **Secondary A Aquifer** comprising the bedrock deposits of the Upper Tunbridge Wells Sand Formation. Examination of the Environment Agency records showed that the site **did not** fall within a Groundwater Source Protection Zone (SPZ) as classified in the Policy and Practice for the Protection of Groundwater.

No surface water features are recorded within 250m of the site.

From analysis of hydrogeological and topographical maps, groundwater was anticipated to be encountered at shallow depth (1 – 3m bgl), within the Kempton Park Gravel Member and it was considered that the groundwater was flowing in a southerly direction, towards the River Thames.

During the site investigation, Made Ground was encountered to 0.95m bgl, overlying sandy clay and gravelly clayey sand and then interbedded sandstone, siltstone and mudstone of the Upper Tunbridge Wells Sand Formation to the base of the boreholes (maximum depth of 25.00m bgl). No groundwater strikes were recorded, however, these may have been masked by the drilling process.

Comparison between the soil laboratory analysis and the derived Level 1 (soils) target concentrations indicate no elevated determinands have the potential to pose a risk to Controlled Waters. It should be noted that a number of determinands at laboratory limit of detection exceed the target concentration for a Level 1 (soils) risk assessment, most notably PAHs. Where a determinand is identified at the laboratory limit of detection, no further assessment is considered necessary.

Given the Level 1 risk assessment does not consider dilution, dispersion or attenuation, the low levels and the likely low mobility of contaminants across the site, it is not expected that the soils on-site represent an unacceptable risk to controlled water receptors, including the Secondary A Aquifer. No further action is considered necessary.

The findings of this risk assessment should be agreed with the Environment Agency.

7.5. Ground Gas Risk Assessment

A review of freely available information prior to site works, including historical mapping and landfill registers / Phase I Desk Study, did not identify any source of ground gas on-site or within influencing distance of the site that warranted investigation through ground gas monitoring. The only source of ground gases was anticipated to be limited Made Ground and therefore classified as 'Low risk', where the pragmatic approach to ground gas risk assessment presented within the CL:AIRE research bulletin RB17 and included within Annex D of BS8485:2015+A1:2019 can be considered.

7.5.1. Pragmatic Approach

The alternative approach to ground gas risk assessment considers the uncertainty from the measurement of ground gas concentrations and flow rates in monitoring wells for low-risk sites and removes the need for monitoring. Low risk sites typically comprise:

- Natural soils with high carbonate content (e.g. chalk);
- Natural soils that can produce gases (e.g. alluvium, peat etc.);
- Made Ground between 1.00m to 5.00m, with low organic content; and
- Areas of flooded mine workings, unless a building is to be within 20m of shaft or adit.

The method considers the gas generation potential of the soils from data that is not subject to external influences, for example atmospheric pressure can change the recorded flow and concentrations of ground gas during spot monitoring, or a rising groundwater level can displace ground gases in pore spaces. Determination of the characteristic situation is based on the total organic carbon (TOC) of the soils, coupled with any organic-rich material identified within the borehole logs, such as wood gravels. TOC is easily analysed by the laboratory and can also be calculated by the equation outlined below.

$$\text{Total Organic Carbon (TOC)} = 0.58 \times \text{Soil Organic Matter (SOM)} = 1.33 \times \text{Degradable Organic Carbon (DOC)}$$

As part of the ground investigation works, six samples were submitted to the laboratory for analysis, which identified TOC to vary between 0.51 and 3.19% in the Made Ground and between 1.21% and 2.71% in the Topsoil. The trial hole logs identified the gravels within the Made Ground to comprise; flint, sandstone and concrete. Made Ground was identified to a maximum depth between 0.70m and 0.95m bgl.

7.5.2. Data Quality

A review was made of the quality of the available data for the site, which can be viewed in the table below. CIRIA Report C665 (2007), BS 8485:2015+A1:2019 and BS 8576:2013 stress the need for risk assessments to be based on good quality data and give guidance as to best practice in this respect.

Review of Data Quality			
Data Type	Current Understanding	UK Practice	Recommendation
Geological and hydro-geological conditions	The CSM identified the site to be located on limited Made Ground (<0.95m), overlying both permeable and impermeable strata of the Upper Tunbridge Wells Sand Formation. Groundwater has been not encountered at shallow depth during drilling.	CIRA C665 & C659, Wilson and Card (1999) and BS 8485 recommend that geology and hydrogeology be fully understood.	The geological and hydrogeological model is understood to a standard that will not comprise the findings of the risk assessment. No further action required.
Soil Laboratory Analysis	A dataset of soil analysis from No. samples have identified a range of TOC concentrations between 0.5% and 3.1% in the Topsoil/Made Ground.	CL:AIRE RB17 outlines an approach to ground gas risk assessment away from the influences that directly affect ground gas monitoring. It should typically be used on sites with limited sources identified in the CSM and Made Ground with average thickness <3m and maximum thickness <5m. TOC should be < 4/6%.	The TOC concentrations are below the limit of 6% in order to use the soil derived approach for the risk assessment. No further action required.

7.5.3. Risk Assessment

The intrusive investigation has revealed a maximum thickness of Made Ground of 0.95m overlying the Upper Tunbridge Wells Sand Formation comprising cohesive and granular soils. Site has undergone a previous phase of construction and limited degradable material has been identified. The introduction of oxygen to the Made Ground through redevelopment may lead to an initial increase of ground gas generation as degradable material within the soils present on-site may act as source of ground gas.

The soils at the site are considered to be of variable permeability (low to high) in nature and pathways for ground gas migration will be present.

Using the soil derived method, it is considered that a TOC value of <1% within soil is unlikely to pose an unacceptable risk from ground gases and the site can be characterised as Characteristic Situation CS1. Any value between 1 and 3% would warrant a classification as a Characteristic Situation CS2. Any value between 3 and 6% would warrant a classification as a Characteristic Situation CS3. Any value over 6% would require investigation through ground gas monitoring. Any site with Made Ground

<1.00m bgl will have a limited gas generation potential from the organic carbon present and consideration should be given to this thickness within the risk assessment.

An alternative approach for ground gas risk assessment (CL:AIRE RB17) can be considered utilising measured concentrations from soil parameters that are independent of influencing factors such as atmospheric pressure and groundwater level. Total Organic Carbon (TOC) was tested on 6No. samples with the analytical results ranging between 0.5 and 3.1%. Furthermore, it is considered that a thickness of <0.95m would not generate sufficient ground gas to pose an unacceptable risk.

Based on the soil derived method outlined and the maximum TOC concentration encountered, the soils from site would warrant classification as **Characteristic Situation CS1**. It should be noted that this only represents the assessment from an on-site source.

7.6. Updated Conceptual Site Model

Following completion of the Phase 2 Site Investigation, the CSM, inclusive of associated risk, within Section 2.8 of this report was re-evaluated.

For ease of reference and understanding, the risks have been re-assigned within this risk assessment against three possible levels / categories, summarised in the table below.

Risk Categories used in the Tabulated CSM	
Low Risk	Regarding this potential SPR linkage, the site is considered suitable for the proposed end-use and there is not considered to be an unacceptable risk to receptors.
Moderate Risk	Regarding this potential SPR linkage, the site is suitable for the proposed end-use however remediation and/or further investigation is required.
High Risk	Regarding this potential SPR linkage, the site is not suitable for proposed end-use and there is an unacceptable risk to receptors. Urgent action required in the short term.

Tabulated Conceptual Site Model – Pollutant Linkage Summary			(On-Site Sources)
Potential Sources	Potential Absorption Pathways	Potential Receptors	Risk Classification
Made Ground from construction activities: - Asbestos, - PAHs, - TPHs, - VOCs, - Sulphates, and - Metals. An Asbestos Management Strategy should be put in place so that any potentially asbestos containing materials are identified and removed from site in a suitable manner to prevent cross-contamination.	- Direct ingestion of soil and soil derived dust - Dermal contact of soil and soil derived dust - Inhalation of dust (indoors and outdoors) with elevated concentration of determinands - Ingestion of home-grown produce, and soils attached - Direct ingestion of groundwater - Inhalation of volatile vapour (indoors and outdoors)	Human Health - End Users (Residents/Future site visitors) - Construction workers during development - Site operatives during maintenance works - Neighbours and public	Low
	- Direct uptake of groundwater - Direct uptake of determinands in the soil	Flora and Fauna Vegetation within soft landscaped areas	Low
	- Anthropogenic (man-made) pathways - Vertical and lateral migration in permeable strata - Surface water runoff	Controlled Waters Secondary A Aquifer (Upper Tunbridge Wells Sand Formation).	Low
	Direct contact with aggressive ground conditions	Building Materials and Services - Buried Concrete - Underground services (water pipes)	Low
Aggressive ground conditions with Made Ground and natural ground, including groundwater: - Sulphates, - PAH/TPH. The sulphates fell into Class DS-1 and AC-1	- Migration through anthropogenic & natural pathways - Inhalation of Asphyxiating gases - Explosion (methane only)	Human Health - End Users (Residents/Future site visitors) - Construction workers during development (especially in confined spaces) - Site operatives during maintenance works in confined spaces - Neighbours and public	Low
	- Migration through anthropogenic & natural pathways - Explosion (methane only)	Building Materials and Services - Buildings - Confined spaces - Underground services	Low
Ground gases generated by Made Ground: - Methane, - Carbon Dioxide, - Hydrogen Sulphide, and - Carbon Monoxide. Based on soil analysis, the site falls into the CS1 classification.			

8. CONTAMINATION RECOMMENDATIONS AND REMEDIATION STRATEGY

Based on the results of the intrusive works, chemical analyses and risk assessments undertaken, no remediation is required.

An Asbestos Management Strategy should be put in place so that any potentially asbestos containing materials are identified and removed from site in a suitable manner to prevent cross-contamination.

8.1. Water Supply Pipes

The Water Supply pipe risk assessment indicated that the use of PE pipes is appropriate at the site and no further measures are required. to prevent an unacceptable risk to future receptors.

8.2. Groundwater

Given the Level 1 risk assessment does not consider dilution, dispersion or attenuation, the low levels and the likely low mobility of contaminants across the site, it is not expected that the soils on-site represent an unacceptable risk to controlled water receptors, including the Secondary A Aquifer. No further action is considered necessary.

The findings of this risk assessment should be agreed with the Environment Agency.

8.3. Ground Gas and Vapours

Based on risk assessment undertaken, the site warrants classification as **Characteristic Situation CS1**, where no precautions to prevent the ingress of ground-gas.

With regards to the risk from vapours, BTEX-MTBE analysis did not show elevated levels that may indicate further testing may be needed.

8.4. Discovery Strategy

A full contamination assessment was beyond the scope of this investigation, where targeted sampling was not undertaken. There may be areas of contamination that have not been identified during the course of the intrusive investigation (e.g. underground storage tanks). Such occurrences may be discovered during the construction phases for the redevelopment of the site.

Groundworkers should be instructed to report to the Site Manager any evidence for such contamination; this may comprise visual indicators, such as fibrous materials within the soil, discolouration, or odours and emission. Upon discovery advice must be taken from a suitably qualified person and then the Local Authority will need to be informed.

8.5. Imported Material

Any soil which is to be imported onto the site must undergo chemical analysis to prove that it is suitable for the purpose for which it is intended.

The soil must be fit for purpose and must either be supplied with traceable chemical laboratory test certificates or be tested, prior to placing (ideally) and after placing, to ensure that the future receptors (human health and vegetation) cannot come into contact with compounds that could be detrimental to their health. The compounds that are to be tested for are those given in the Generic Assessment Criteria, which can be viewed in Appendix F of this report.

8.6. Waste Disposal

The excavation of foundations and other soils is likely to produce waste which will require classification and then recycling or removal from site.

Under the Landfill (England and Wales) Regulations 2002 (as amended), prior to disposal, all waste must be classified as either: Inert; Non-hazardous; or Hazardous.

The Environment Agency's Hazardous Waste Technical Guidance (WM3) document outlines the methodology for classifying wastes. Once classified the waste can be removed to the appropriately licensed facilities, with some waste requiring pre-treatments prior to disposal.

Following the investigation, 5No. samples were submitted to the analytical laboratory to undergo a suite of testing for contamination testing, as discussed in the previous sections. Sampling depths were chosen to reflect the receptor of concern, human health, and typically comprised a surface or near surface sample and periodically to 1.00m bgl. Any horizon where olfactory or visual evidence of contamination was present was also sampled.

Based on a risk phase analysis of the chemical laboratory test results, in accordance with EC Hazardous Waste Directive and undertaken by Ground and Water Limited, all soil samples of Made Ground and Topsoil encountered on-site were NON-HAZARDOUS. The results of the assessment are given within Appendix G.

It is important to note that whilst we consider our in-house assessment tool to be an accurate interpretation of the requirements of WM3, therefore producing an initial classification in accordance with the guidance, this method classifies soils as either non-hazardous or hazardous and landfill operators have their own assessment tools and can often come to different conclusions. As a result, some landfill operators could refuse to take apparently suitable waste. It is recommended that the receiving landfill views the results of this assessment and the chemical laboratory results to determine their own classification.

In addition to the samples described above, 1No. sample of the Topsoil (TP5/0.20m bgl) was scheduled to undergo Waste Acceptance Criteria (WAC) testing with single batch leachate from samples with a range of depths. The results indicate that the sample conformed to the Inert Waste Classification.

8.7. Duty of Care

Groundworkers must maintain a good standard of personal hygiene including the wearing of overalls, boots, gloves and eye protectors and the use of dust masks during periods of dry weather.

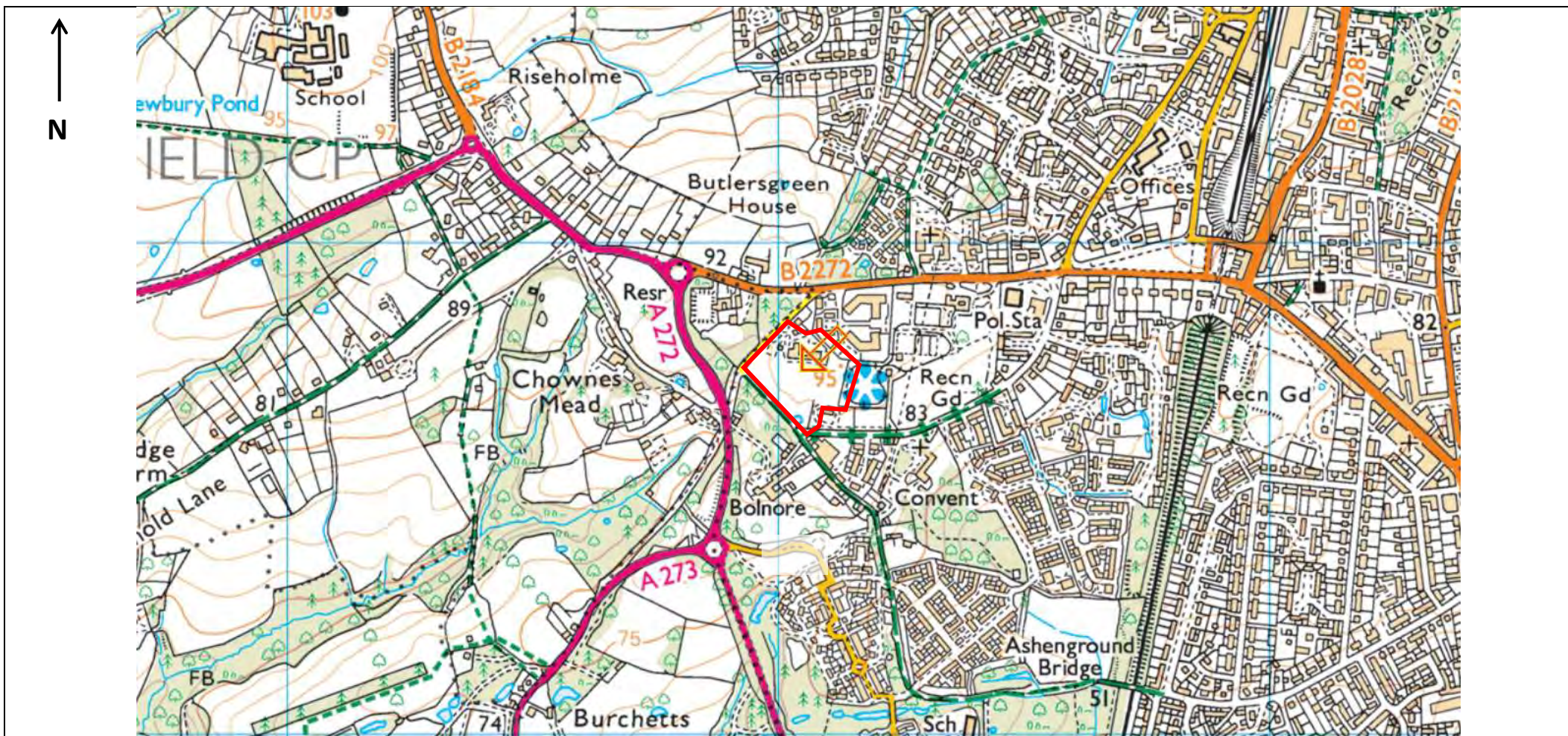
To prevent exposure to airborne dust by both the general public and construction personnel the site should be kept damp during dry weather and at other times when dust would be generated as a result of construction activities.

The site should be securely fenced at all times to prevent unauthorised access. Washing facilities should be provided and eating restricted to mess huts.

FIGURES

2 The Long Barn, Norton Farm, Selborne Road, Alton, Hampshire GU34 3NB
0333 600 1221 enquiries@groundandwater.co.uk groundandwater.co.uk

Registered Office: Rintoul House, 31, Horse Fair, Barbours, Oxfordshire OX16 6AE Registered in England No 07052903



— APPROXIMATE SITE BOUNDARY

NOTE: NOT TO SCALE

Downlands Park, Issacs Lane, Haywards Heath, West Sussex RH16 4BQ

Figure 1

Client:
Four Quarters Developments Limited c/o Symmetrys

Date:
June 2022

Site Location Plan

Ref:
GWPR4765





APPROXIMATE SITE BOUNDARY

NOTE: NOT TO SCALE

Downlands Park, Issacs Lane, Haywards Heath, West Sussex RH16 4BQ

Figure 2

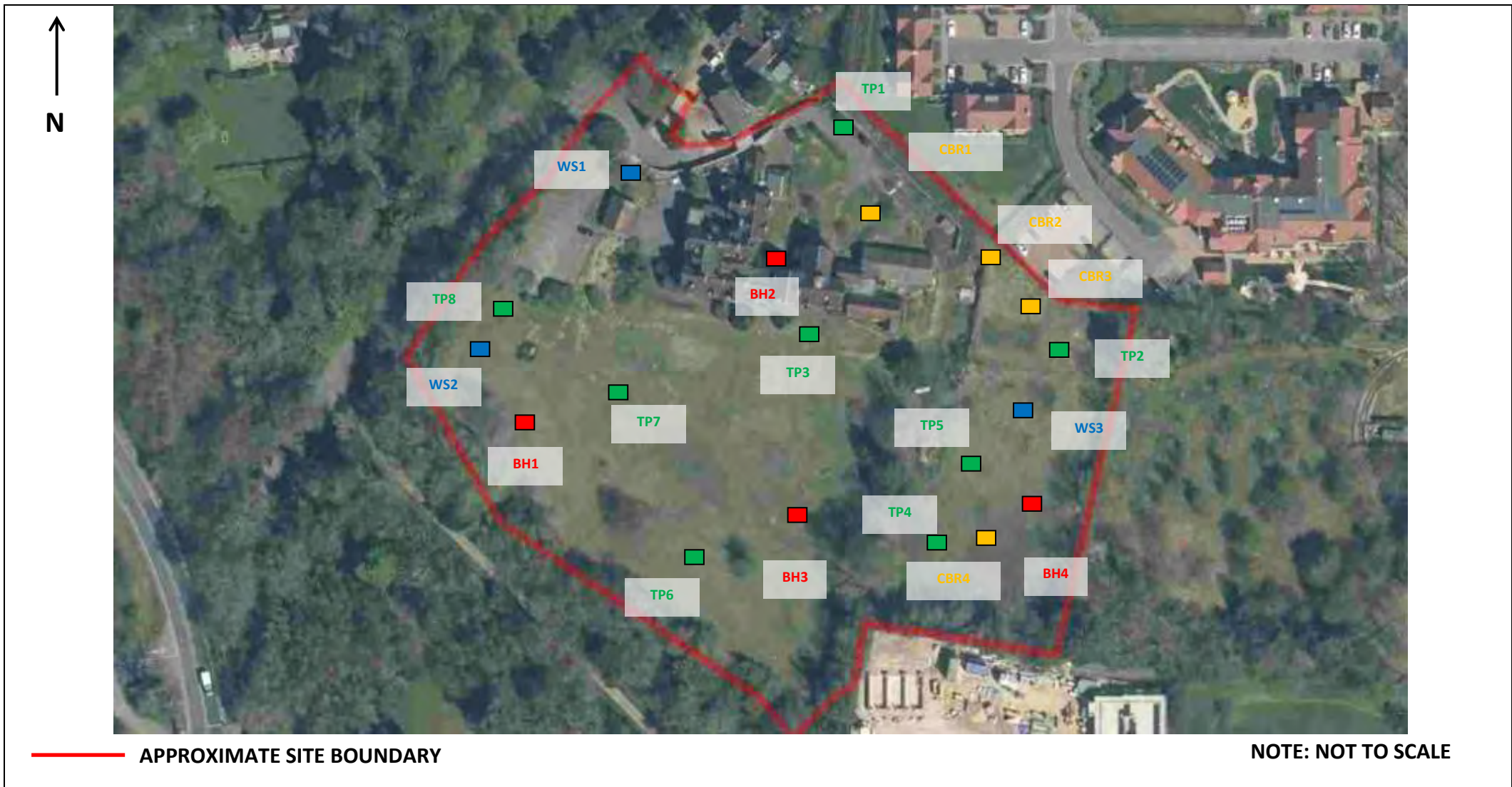
Client:
Four Quarters Developments Limited c/o Symmetrys

Date:
June 2022

Proposed Development Plan

Ref:
GWPR4765





Site: Downslands Park, Issacs Lane, Haywards Heath, West Sussex RH16 4BQ		Figure 3 
Client: Four Quarters Developments Limited c/o Symmetrys	Date: June 2022	
Trial Hole Location Plan	Ref: GWPR4765	

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N



— APPROXIMATE SITE BOUNDARY

NOTE: NOT TO SCALE

Downlands Park, Issacs Lane, Haywards Heath, West Sussex RH16 4BQ

Client:
Four Quarters Developments Limited c/o Symmetrys

Date:
June 2022

Trial Pit Foundation Exposure TP/FE1

Ref:
GWPR4765

Figure 4



APPENDIX A:

Conditions and Limitations

The ground is a product of continuing natural and artificial processes. As a result, the ground will exhibit a variety of characteristics that vary from place to place across a site, and also with time. Whilst a ground investigation will mitigate to a greater or lesser degree against the resulting risk from variation, the risks cannot be eliminated.

The report has been prepared on the basis of information, data and materials which were available at the time of writing. Accordingly, any conclusions, opinions or judgements made in the report should not be regarded as definitive or relied upon to the exclusion of other information, opinions and judgements.

The investigation, interpretations, and recommendations given in this report were prepared for the sole benefit of the client in accordance with their brief; as such these do not necessarily address all aspects of ground behaviour at the site. No liability is accepted for any reliance placed on it by others unless specifically agreed in writing.

Any decisions made by you, or by any organisation, agency or person who has read, received or been provided with information contained in the report ("you" or "the Recipient") are decisions of the Recipient and we will not make, or be deemed to make, any decisions on behalf of any Recipient. We will not be liable for the consequences of any such decisions.

Current regulations and good practice were used in the preparation of this report. An appropriately qualified person must review the recommendations given in this report at the time of preparation of the scheme design to ensure that any recommendations given remain valid in light of changes in regulation and practice, or additional information obtained regarding the site.

Any Recipient must take into account any other factors apart from the Report of which they and their experts and advisers are or should be aware. The information, data, conclusions, opinions and judgements set out in the report may relate to certain contexts and may not be suitable in other contexts. It is your responsibility to ensure that you do not use the information we provide in the wrong context.

This report is based on readily available geological records, the recorded physical investigation, the strata observed in the works, together with the results of completed site and laboratory tests. Whilst skill and care has been taken to interpret these conditions likely between or below investigation points, the possibility of other characteristics not revealed cannot be discounted, for which no liability can be accepted. The impact of our assessment on other aspects of the development required evaluation by other involved parties.

The opinions expressed cannot be absolute due to the limitations of time and resources within the context of the agreed brief and the possibility of unrecorded previous in ground activities. The ground conditions have been sampled or monitored in recorded locations and tests for some of the more common chemicals generally expected. Other concentrations of types of chemicals may exist. It was not part of the scope of this report to comment on environment/contaminated land considerations.

The conclusions and recommendations relate to Downlands Park, Issacs Lane, Haywards Heath, West Sussex RH16 4BQ.

Trial hole is a generic term used to describe a method of direct investigation. The term trial pit, borehole or window sampler borehole implies the specific technique used to produce a trial hole.

The depth to roots and/or of desiccation may vary from that found during the investigation. The client is responsible for establishing the depth to roots and/or of desiccation on a plot-by-plot basis prior to the construction of foundations. Where trees are mentioned in the text this means existing trees, recently removed trees (approximately 15 years to full recovery on cohesive soils) and those planned as part of the site landscaping.

Ownership of copyright of all printed material including reports, laboratory test results, trial pit and borehole log sheets, including drillers log sheets, remain with Ground and Water Limited. Licence is for the sole use of the client and may not be assigned, transferred or given to a third party.

Only our client may rely on this report and should this report or any information contained in it be provided to any third party we accept no responsibility to the third party for the contents of this report save to the extent expressly outlined by us in writing in a reliance letter addressed from us to the third party.

Recipients are not permitted to publish this report outside of their organisation without our express written consent.

APPENDIX B:

Technical Glossary

TECHNICAL GLOSSARY

The list of possible definitions within the report may be seen below. Please note that some definitions may not be relevant to this report.

HYDROGEOLOGY:

A **Principal Aquifer** is a layer of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.

Secondary aquifers include a wide range of drift deposits with an equally wide range of water permeability and storage capacities.

Secondary (A) Aquifers consist of deposits with permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as Minor Aquifers.

Secondary (B) Aquifers consist of deposits with predominantly lower permeability layers with may stoke and yield limited amounts of groundwater due to localised features such as fissures, think permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.

Secondary Aquifers (Undifferentiated) are assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both a minor aquifer and non-aquifer in different locations due to the variable characteristics of the rock type.

Unproductive Strata are rock layers with low permeability that have negligible significance for water supply or river base flow. These were formerly classified as non-aquifers.

FLOOD ZONES:

Environment Agency Flood Zone 2, defined as; land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.

Environment Agency Flood Zone 3 shows the extent of a river flood with a 1 in 100 (1% or greater chance of occurring in any year or a sea flood with a 1 in 200 (0.5%) or greater chance of occurring in any year.

Environment Agency Flood Zone 3 area that benefits from flood defences, defined as; land and property in this flood zone would have a high probability of flooding without the local flood defences. These protect the area against a river flood with a 1% chance of happening each year, or a flood from the sea with a 0.5% chance of happening each year.

GROUNDWATER SOURCE PROTECTION ZONES (SPZS):

Inner zone (SPZ1): This zone is 50 day travel time of pollutant to source with a 50 metres default minimum radius.

Outer zone (SPZ2): This zone is 400 day travel time of pollutant to source. This has a 250 or 500 metres minimum radius around the source depending on the amount of water taken.

Total catchment (SPZ3): This is the area around a supply source within which all the groundwater ends up at the abstraction point. This is the point from where the water is taken. This could extend some distance from the source point.

Zone of special interest (SPZ4): This zone is where local conditions require additional protection.

IN-SITU STRENGTH GEOTECHNICAL TESTING:

Windowless Sample and/or Cable Percussion and/or Rotary Boreholes provide samples of the ground for assessment but they do not give any engineering data. The standard penetration test (SPT) is an in-situ dynamic penetration test designed to provide information on the geotechnical engineering properties of soil. The test uses a thick-walled sample tube, with an outside diameter of 50mm and an inside diameter of 35mm, and a length of around 650mm. This is driven into the ground at the bottom of a borehole by blows from a slide hammer with a weight of 63.5kg falling through a distance of 760mm. The sample tube is driven 150mm into the ground and then the number of blows needed for the tube to penetrate each 75mm up to a depth of 450mm is recorded. The sum of the number of blows is termed the "standard penetration resistance" or the "N-value".

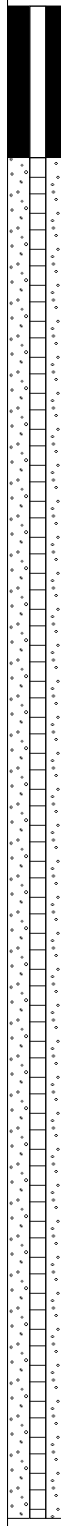
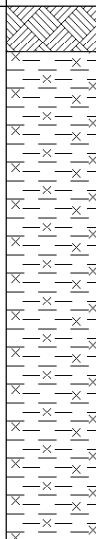
Dynamic Probing involves the driving of a metal cone into the ground via a series of steel rods. These rods are driven from the surface by a hammer system that lifts and drops a 63.5kg (SHDP) hammer onto the top of the rods through a set height, thus ensuring a consistent energy input. The number of hammer blows that are required to drive the cone down by each 100mm increment are recorded. These blow counts then provide a comparative assessment from which correlations have been published, based on dynamic energy, which permits engineering parameters to be generated. (The Dynamic Probe 'Super Heavy' (SHDP) Tests were conducted in accordance with BS 1377; 1990; Part 9, Clause 3.2).

APPENDIX C:

Trial Hole Logs

Rotary Core Log

Project Name: Downlands Park,		Client: Four Quarters Developments Limited c/o Symmetrys		Date: 29/04/2022 - 03/05/2022	
Location: Bolmore Farm Lane, Haywards Heath, West Sussex		Contractor: JG			
Project No. : GWPR4765		Crew Name:		Drilling Equipment:	
Borehole Number BH1	Hole Type RC	Level	Logged By	Scale 1:50	Page Number Sheet 1 of 2

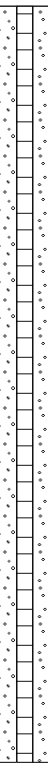
Well	Water	Depth (m)	Type /FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
		0.30								Light brown slightly gravelly SAND. The sand was fine to medium grained and the gravel was fine to medium, sub-angular to sub-rounded sandstone. (TOPSOIL). Pale orange and pale grey mottled silty CLAY with thin bands of orange and grey iron stained sandstone. (UPPER TUNBRIDGE WELLS SAND FORMATION).	1
		2.00 1.50 - 3.00	D	66	66	66					2
		2.70 - 3.00	C								3
		3.00 - 4.50 4.00	D	93	66	66	3.60			Pale orange and pale grey mottled fine grained SANDSTONE. (UPPER TUNBRIDGE WELLS SAND FORMATION)	4
		4.50 - 6.00 5.50 - 5.75	C	100	93	93	4.80 5.10 5.20			Pale grey fine grained SANDSTONE. (UPPER TUNBRIDGE WELLS SAND FORMATION). Orange fine grained SANDSTONE. (UPPER TUNBRIDGE WELLS SAND FORMATION). Pale grey fine grained SANDSTONE. (UPPER TUNBRIDGE WELLS SANDSTONE).	5 6
		6.30 6.00 - 7.50 7.00 7.20 - 7.47	D D C	100	100	90	6.70			Orange and pale grey fine grained SANDSTONE. (UPPER TUNBRIDGE WELLS SANDSTONE).	7
		7.75 7.50 - 9.00	D	100	93	93	7.40			Pale grey fine grained SANDSTONE. (UPPER TUNBRIDGE WELLS SANDSTONE).	8
		9.00 9.00 - 10.50	D	100	66	57					9
		10.00	D								10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)

Remarks																
Roots noted to 0.30m Groundwater not encountered.																

Rotary Core Log

Project Name: Downlands Park,		Client: Four Quarters Developments Limited c/o Symmetrys		Date: 29/04/2022 - 03/05/2022	
Location: Bolmore Farm Lane, Haywards Heath, West Sussex		Contractor: JG			
Project No. : GWPR4765		Crew Name:		Drilling Equipment:	
Borehole Number BH1	Hole Type RC	Level		Logged By	Scale 1:50
				Page Number Sheet 2 of 2	

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD						
		10.50 - 12.00	D	100	47	47		10.60			Pale grey fine grained SANDSTONE. (UPPER TUNBRIDGE WELLS SANDSTONE).	11
								11.60			Pale brown fine grained SANDSTONE. (UPPER TUNBRIDGE WELLS SANDSTONE).	
		12.00	D								Dark grey fissured SILTSTONE/ MUDSTONE. (UPPER TUNBRIDGE WELLS SANDSTONE).	12
		12.00 - 13.50 13.00		100	57	40						13
		13.50 - 15.00 14.50 - 14.70	C	73	66	60		15.00				14
											End of Borehole at 15.000m	15
												16
												17
												18
												19
												20

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)

Remarks Roots noted to 0.30m Groundwater not encountered.																	
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Rotary Core Log

Project Name: Downlands Park,		Client: Four Quarters Developments Limited c/o Symmetrys		Date: 25/04/2022 - 26/04/2022	
Location: Bolmore Farm Lane, Haywards Heath, West Sussex		Contractor: JG			
Project No. : GWPR4765		Crew Name:		Drilling Equipment:	
Borehole Number BH2	Hole Type RC	Level		Logged By	Scale 1:50
				Page Number Sheet 2 of 2	

Well	Water	Depth (m)	Type /FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
		10.50	D				10.10			Olive green and dark brown mottled MUDSTONE. (UPPER TUNBRIDGE WELLS SAND FORMATION).	
		11.00	D				10.70			Orange and grey mottled fine grained SANDSTONE. (UPPER TUNBRIDGE WELLS SAND FORMATION).	
		10.50 - 12.00		100	87	80	11.20			Olive green gravelly CLAY. The gravel was fine to coarse, sub-angular to sub-rounded sandstone. (UPPER TUNBRIDGE WELLS SAND FORMATION).	11
		12.00	D							Dark brown and dark grey mottled MUDSTONE. (UPPER TUNBRIDGE WELLS SAND FORMATION).	12
		12.00 - 13.50		80	67	67					
		13.00	D								
		14.00	D								
		13.50 - 15.00		87	73	73					
		15.00	D				15.00			End of Borehole at 15.000m	15
											16
											17
											18
											19
											20

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)

Remarks Roots noted to 0.80m bgl. Groundwater not encountered.																	
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Rotary Core Log

Project Name: Downlands Park,			Client: Four Quarters Developments Limited c/o Symmetrys			Date: 27/04/2022 - 28/04/2022		
Location: Bolmore Farm Lane, Haywards Heath, West Sussex			Contractor: JG					
Project No. : GWPR4765			Crew Name:			Drilling Equipment:		
Borehole Number BH3		Hole Type RC		Level		Logged By		Scale 1:50
								Page Number Sheet 3 of 3

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD						
		20.00 - 21.50	D	80	73	63		20.50			Grey thinly bedded fine grained SANDSTONE. (UPPER TUNBRIDGE WELLS SAND FORMATION).	21
		21.50 - 22.50		100	100	100					Pale brown fine grained SANDSTONE. (UPPER TUNBRIDGE WELLS SAND FORMATION).	22
		23.00 22.50 - 24.00		80	73	47		23.10			Pale orange brown fine grained SANDSTONE. (UPPER TUNBRIDGE WELLS SAND FORMATION).	23
		24.00 - 25.00		100	90	90		23.90			Pale brown fine grained SANDSTONE. (UPPER TUNBRIDGE WELLS SAND FORMATION).	24
								25.00			End of Borehole at 25.000m	25
												26
												27
												28
												29
												30

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)

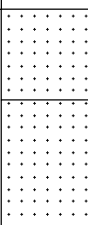
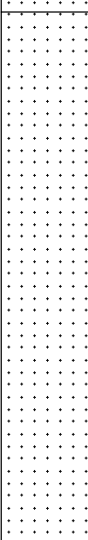
Remarks Roots noted to 0.30m bgl. Groundwater not encountered.																	
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Rotary Core Log

Project Name: Downlands Park,				Client: Four Quarters Developments Limited c/o Symmetrys				Date: 04/05/2022 - 06/05/2022									
Location: Bolmore Farm Lane, Haywards Heath, West Sussex				Contractor: JG													
Project No. : GWPR4765				Crew Name:				Drilling Equipment:									
Borehole Number BH4		Hole Type RC		Level		Logged By		Scale 1:50		Page Number Sheet 1 of 2							
Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description						
				TCR	SCR	RQD											
		0.40	D				50 (5,8/50 for 225mm) 50 (14,11/ 50 for 9mm)	0.40			Pale brown slightly gravelly SAND. (TOPSOIL).	1					
										Pale orange and pale grey mottled silty CLAY with thin bands of orange and grey iron stained sandstone. (UPPER TUNBRIDGE WELLS SAND FORMATION).							
		1.50	C	73	40	40	50 (25 for 75mm/ 50 for 8mm)	3.80			Pale orange and pale grey SILTSTONE. (UPPER TUNBRIDGE WELLS SAND FORMATION).	4					
		1.50 - 3.00															
		2.75 - 3.00	D	100	90	90	50 (25 for 75mm/ 50 for 8mm)	4.50			Brown, orange and grey mottled fine grained SANDSTONE. (UPPER TUNBRIDGE WELLS SAND FORMATION).	5					
		3.00 - 4.50 3.90 - 4.15															
		5.00	D	87	67	67	50 (25 for 75mm/ 50 for 8mm)	5.80			Grey fine grained SANDSTONE. (UPPER TUNBRIDGE WELLS SAND FORMATION).	6					
		4.50 - 6.00															
		6.00	C	93	67	67	50 (25 for 75mm/ 50 for 8mm)	6.10			Pale brown and pale grey mottled fine grained SANDSTONE. (UPPER TUNBRIDGE WELLS SAND FORMATION).	7					
		6.00 - 7.50 7.10 - 7.35															
7.50 - 9.00 8.50	D	100	90	90	50 (25 for 75mm/ 50 for 8mm)	7.10			Pale grey and pale orange fine grained SANDSTONE. (UPPER TUNBRIDGE WELLS SAND FORMATION).	8							
9.00 - 10.50		100	100	100		9.20			Dark grey, red brown and red mottled fine grained SANDSTONE. (UPPER TUNBRIDGE WELLS SAND FORMATION).	9							
											10						
Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
Remarks																	
Roots noted to 0.30m. Groundwater not encountered.																	

Rotary Core Log

Project Name: Downlands Park,			Client: Four Quarters Developments Limited c/o Symmetrys			Date: 04/05/2022 - 06/05/2022		
Location: Bolmore Farm Lane, Haywards Heath, West Sussex			Contractor: JG					
Project No. : GWPR4765			Crew Name:			Drilling Equipment:		
Borehole Number BH4		Hole Type RC		Level		Logged By		Scale 1:50
								Page Number Sheet 2 of 2

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description						
				TCR	SCR	RQD											
		10.20	D					10.60			Dark grey, red brown and red mottled fine grained SANDSTONE. (UPPER TUNBRIDGE WELLS SAND FORMATION).	11					
		10.70 - 11.00	C								Olive green and red mottled fine grained SANDSTONE. (UPPER TUNBRIDGE WELLS SAND FORMATION).						
		10.50 - 12.00		100	100	100		11.50			Pale green grey fine grained SANDSTONE. (UPPER TUNBRIDGE WELLS SAND FORMATION).	12					
		11.80	D														
		12.00 - 13.00	C	100	90	90							13				
		13.40	D														
		13.50 - 15.00	D	100	80	80		15.00			End of Borehole at 15.000m	15					
														16			
														17			
												18					
												19					
												20					
Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)

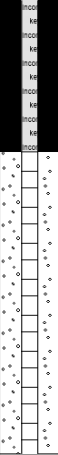
Remarks

Roots noted to 0.30m. Groundwater not encountered.



Percussion Drilling Log

Project Name: Downlands Park,		Client: Four Quarters Developments Limited c/o Symmetrys		Date: 10/05/2022	
Location: Bolmore Farm Lane, Haywards Heath, West Sussex		Contractor: JG		Co-ords: E532017.58 N123821.39	
Project No. : GWPR4765		Crew Name:		Drilling Equipment:	
Borehole Number WS1	Hole Type WLS	Level	Logged By	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.00 - 0.20	D					MADE GROUND. Brown gravelly clayey medium and coarse SAND. The gavel was fine to coarse sub-angular flint. (90%) and brick (10%).	
		0.40 - 0.50	D		0.30			Light brown gravelly coarse SAND. The gravel was fine to coarse sub-angular sandstone. (UPPER TUNBRIDGE WELLS SAND FORMATION).	
		0.70 - 0.80	D						
		0.90 - 1.00	D						
		1.00	SPT	N=22 (5,5/5,5,6,6)	1.00				1
		1.40 - 1.50	D						
		1.90 - 2.00	D						
		2.00	SPT	N=29 (4,5/6,5,7,11)					2
		2.50	D						
		2.90 - 3.00	D						
		3.00	SPT	N=53 (9,11/13,13,14,13)	3.00			Grey and orange gravelly coarse SAND. The gravel was fine sub-angular sandstone. UPPER TUNBRIDGE WELLS SAND FORMATION).	3
								End of Borehole at 3.000m	
									4
									5
									6
									7
									8
									9
									10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks	
Roots noted to 0.60m bgl. Groundwater not encountered.	



Percussion Drilling Log

Project Name: Downlands Park,		Client: Four Quarters Developments Limited c/o Symmetrys		Date: 10/05/2022	
Location: Bolmore Farm Lane, Haywards Heath, West Sussex		Contractor: JG			
Project No. : GWPR4765		Crew Name:		Drilling Equipment:	
Borehole Number WS2	Hole Type WLS	Level	Logged By	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	D		0.40			Brown sandy CLAY. The sand was fine grained. (TOPSOIL).	1
		0.50	D					Pale orange and pale grey silty CLAY. UPPER TUNBRIDGE WELLS SAND FORMATION).	
		1.00	D		1.50				2
		1.50	D					End of Borehole at 1.500m	
									3
									4
									5
									6
									7
									8
									9
									10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks Roots noted to 0.40m bgl. Groundwater not encountered.	
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Date: 10/05/2022

Contractor: JG

Drilling Equipment:

Page Number
Sheet 1 of 1[illegible]



Trial Pit Log

Project Name: Downlands Park,		Client: Four Quarters Developments Limited c/o Symmetrys		Date: 10/05/2022	
Location: Bolmore Farm Lane, Haywards Heath, West Sussex		Contractor: JG		Co-ords: E532017.85 N123821.18	
Project No. : GWPR4765		Crew Name:		Equipment:	
Location Number TP1	Location Type TP	Level	Logged By	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	D					Brown gravelly fine and medium SAND. The gravel was fine sub-angular of flint. (TOPSOIL)	
					0.50				
		1.00	D					Brown gravelly clayey coarse SAND. Gravel was fine to medium, sub-angular to sub-rounded sandstone. (UPPER TUNBRIDGE WELLS SAND FORMATION).	1
					1.20			End of Borehole at 1.200m	
									2
									3
									4
									5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks

Remarks
Roots noted to 1.10m. Groundwater not encountered.



Trial Pit Log

Project Name: Downlands Park,		Client: Four Quarters Developments Limited c/o Symmetrys		Date: 09/05/2022 - 12/05/2022	
Location: Bolmore Farm Lane, Haywards Heath, West Sussex		Contractor: JG			
Project No. : GWPR4765		Crew Name:		Equipment:	
Location Number TP2	Location Type TP	Level	Logged By	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	D		0.15			Pale brown slightly gravelly SAND. The sand was fine to coarse grained and the gravel was fine to coarse sub-angular to sub-rounded sandstone. (TOPSOIL)	
					0.70			Orange brown slightly gravelly clayey SAND. The sand was fine to coarse and the gravel was fine to coarse sub-angular to sub-rounded sandstone(95%) and brick (5%). (MADE GROUND).	
		1.00	D					Orange brown and grey mottled sandy CLAY. (UPPER TUNBRIDGE WELLS SAND FORMATION).	1
		2.00	D		1.70			Pale grey and pale orange silty CLAY. (UPPER TUNBRIDGE WELLS SAND FORMATION).	2
					2.30			End of Borehole at 2.300m	3
									4
									5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks

Remarks Roots noted to 0.70m bgl. Groundwater not encountered.							
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Trial Pit Log

Project Name: Downlands Park,		Client: Four Quarters Developments Limited c/o Symmetrys		Date: 09/05/2022 - 12/05/2022	
Location: Bolmore Farm Lane, Haywards Heath, West Sussex		Contractor: JG			
Project No. : GWPR4765		Crew Name:		Equipment:	
Location Number TP3	Location Type TP	Level	Logged By	Scale 1:25	Page Number Sheet 1 of 1

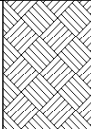
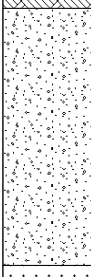
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	D		0.35			Pale brown slightly gravelly SAND. The sand was fine to coarse grained and the gravel was fine to medium sub-angular to sub-rounded sandstone. (TOPSOIL)	
								Orange and pale brown mottled silty CLAY. (UPPER TUNBRIDGE WELLS SAND FORMATION).	
		1.00	D		1.50				1
								Orange brown and pale grey mottled clayey SAND. The sand was fine to medium grained. (UPPER TUNBRIDGE WELLS SAND FORMATION).	
		2.00	D		2.20				2
								End of Borehole at 2.200m	
									3
									4
									5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks

Remarks	
Roots noted to 0.70m bgl. Groundwater not encountered.	

Trial Pit Log

Project Name: Downlands Park,		Client: Four Quarters Developments Limited c/o Symmetrys		Date: 09/05/2022 - 12/05/2022	
Location: Bolmore Farm Lane, Haywards Heath, West Sussex		Contractor: JG			
Project No. : GWPR4765		Crew Name:		Equipment:	
Location Number TP4	Location Type TP	Level	Logged By	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	D		0.45			Pale brown slightly gravelly SAND. The sand was fine to medium grained and the gravel was fine to medium, sub-angular to sub-rounded sandstone, (TOPSOIL).	1
								Orange slightly gravelly SAND. The sand was fine to medium grained and the gravel was fine to medium, sub-angular to sub-rounded sandstone. (UPPER TUNBRIDGE WELLS SAND FORMATION).	
		1.00	D		1.30 1.35			Orange and grey fine grained SANDSTONE. (UPPER TUNBRIDGE WELLS SAND FORMATION). End of Borehole at 1.350m	
									2
									3
									4
									5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks

Remarks Roots noted to 0.65m bgl. Groundwater not encountered.							
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Trial Pit Log

Project Name: Downlands Park,		Client: Four Quarters Developments Limited c/o Symmetrys		Date: 09/05/2022 - 12/05/2022	
Location: Bolmore Farm Lane, Haywards Heath, West Sussex		Contractor: JG			
Project No. : GWPR4765		Crew Name:		Equipment:	
Location Number TP5	Location Type TP	Level	Logged By	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	D		0.22			Pale brown slight gravelly SAND. The sand was fine to medium grained and the gravel was fine to medium, sub-angular to sub-rounded sandstone. (TOPSOIL).	1
								Orange slightly gravelly SAND. The sand was fine to medium sand and the gravel was fine to medium, sub-angular to sub-rounded sandstone. (UPPER TUNBRIDGE WELLS SAND FORMATION).	
		1.00	D		0.90			Pale grey silty CLAY. (UPPER TUNBRIDGE WELLS SAND FORMATION).	
		2.00	D		2.00			End of Borehole at 2.000m	2
									3
									4
									5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks

Remarks

Roots noted to 0.72m bgl. Groundwater not encountered.





Date: 09/05/2022 - 12/05/2022

Contractor: JG

Crew Name:

Equipment:

Page Number
Sheet 1 of 1

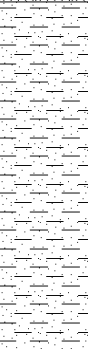
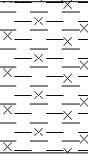
Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks

Roots noted to 0.19m bgl. Groundwater not encountered.



Trial Pit Log

Project Name: Downlands Park,		Client: Four Quarters Developments Limited c/o Symmetrys		Date: 09/05/2022 - 12/05/2022	
Location: Bolmore Farm Lane, Haywards Heath, West Sussex		Contractor: JG			
Project No. : GWPR4765		Crew Name:		Equipment:	
Location Number TP7	Location Type TP	Level	Logged By	Scale 1:25	Page Number Sheet 1 of 1

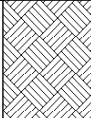
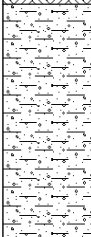
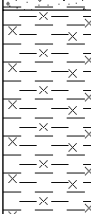
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	D		0.25			Pale brown slightly gravelly SAND. The sand was fine to medium grained and the gravel was fine to medium, sub-angular to sub-rounded sandstone. (TOPSOIL).	1
		1.00	D		1.40			Orange brown and grey mottled sandy CLAY. The sand was fine to medium grained. (UPPER TUNBRIDGE WELLS SAND FORMATION).	
		1.90	D		1.90			Pale grey silty CLAY. (UPPER TUNBRIDGE WELLS SAND FORMATION).	
								End of Borehole at 1.900m	2
									3
									4
									5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks

Remarks Roots noted to 0.26m bgl. Groundwater not encountered.							
--	--	--	--	--	--	--	---

Trial Pit Log

Project Name: Downlands Park,		Client: Four Quarters Developments Limited c/o Symmetrys		Date: 09/05/2022 - 12/05/2022	
Location: Bolmore Farm Lane, Haywards Heath, West Sussex		Contractor: JG			
Project No. : GWPR4765		Crew Name:		Equipment:	
Location Number TP8	Location Type TP	Level	Logged By	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	D		0.40			Pale brown clayey SAND. The sand was fine to medium grained. (TOPSOIL)	1
								Orange and grey mottled slightly gravelly sandy CLAY. The sand was fine to medium grained and the gravel was fine to medium, sub-angular to sub-rounded sandstone. (UPPER TUNBRIDGE WELLS SAND FORMATION).	
		1.00	D		1.20			Pale grey silty CLAY. (UPPER TUNBRIDGE WELLS SAND FORMATION).	
		1.90	D		1.90			End of Borehole at 1.900m	2
									3
									4
									5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks

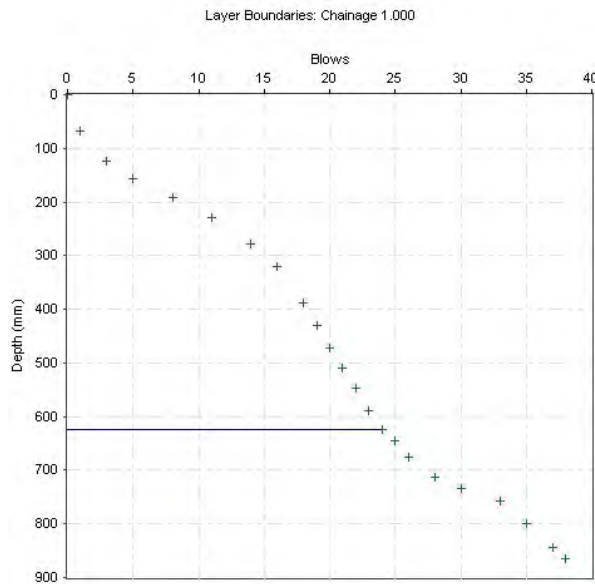
Remarks Roots noted to 0.80m bgl. Groundwater not encountered.							
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DCP Layer Strength Analysis Report

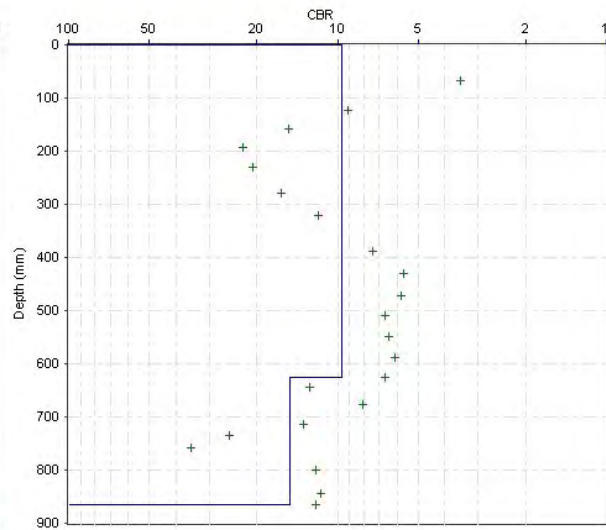
Project Name: GWPR4765 DCP1

Chainage (km): 1.000
 Direction: 1
 Location/Offset: Lay-by / other/1.00m
 Cone Angle: 60 degrees
 Zero Error (mm): 86
 Test Date: 10/05/2022

Surface Type: Unpaved
 Thickness (mm): 0
 Base Type:
 Thickness (mm):
 Surface Moisture: Unknown
 Moisture adjustment factor: Not adjusted



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)
1	26.04	10	625	625
2	17.14	15	240	865

CBR Relationship:

TRL equation: $\log_{10}(\text{CBR}) = 2.48 - 1.057 \times \log_{10}(\text{Strength})$

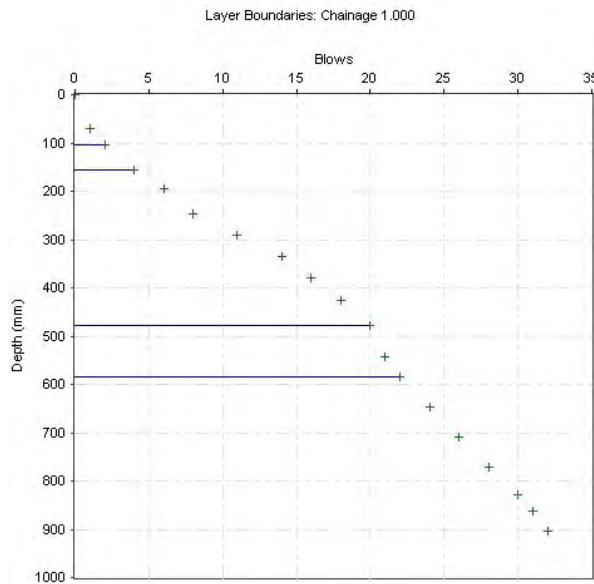
Report produced by

DCP Layer Strength Analysis Report

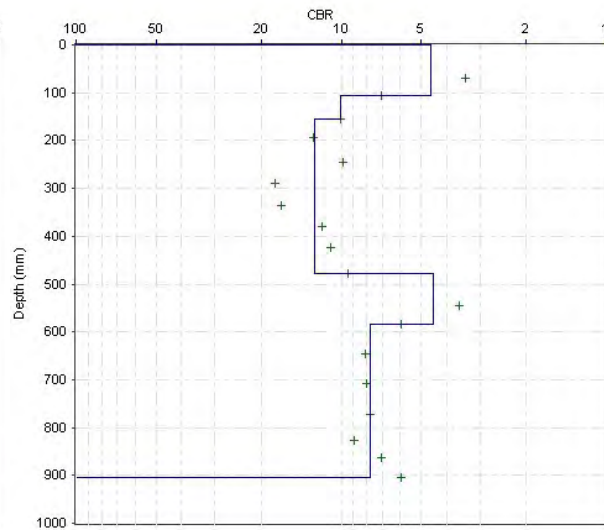
Project Name: GWPR4765 DCP2

Chainage (km): 1.000
 Direction:
 Location/Offset: Lay-by / other
 Cone Angle: 60 degrees
 Zero Error (mm): 51
 Test Date: 24/06/2022

Surface Type: Unpaved
 Thickness (mm): 0
 Base Type:
 Thickness (mm):
 Surface Moisture: Unknown
 Moisture adjustment factor: Not adjusted



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)
1	52.50	5	105	105
2	25.00	10	50	155
3	20.19	13	323	478
4	53.50	4	107	585
5	31.90	8	319	904

CBR Relationship:

TRL equation: $\log_{10}(\text{CBR}) = 2.48 - 1.057 \times \log_{10}(\text{Strength})$

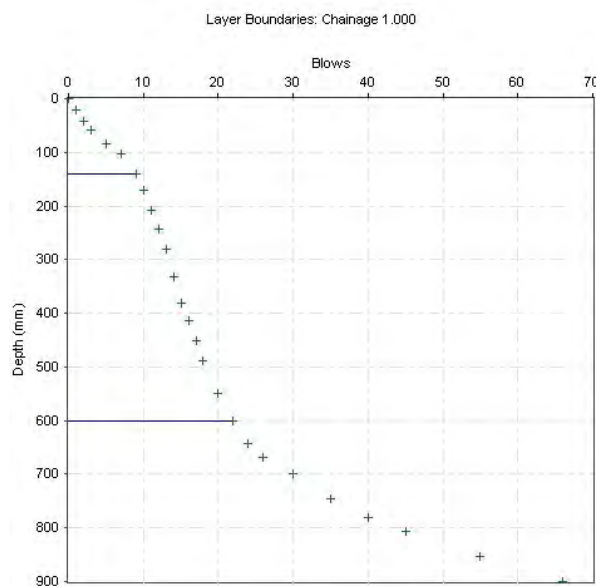
Report produced by

DCP Layer Strength Analysis Report

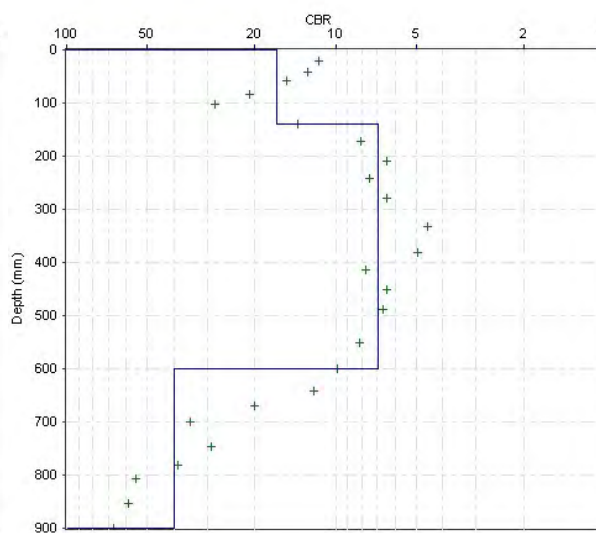
Project Name: GWPR4765 DCP3

Chainage (km): 1.000
 Direction:
 Location/Offset: Carriageway/1.00m
 Cone Angle: 60 degrees
 Zero Error (mm): 51
 Test Date: 10/05/2022

Surface Type: Unpaved
 Thickness (mm): 0
 Base Type:
 Thickness (mm):
 Surface Moisture: Unknown
 Moisture adjustment factor: Not adjusted



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)
1	15.56	17	140	140
2	35.46	7	461	601
3	6.77	40	298	899

CBR Relationship:

TRL equation: $\log_{10}(\text{CBR}) = 2.48 - 1.057 \times \log_{10}(\text{Strength})$

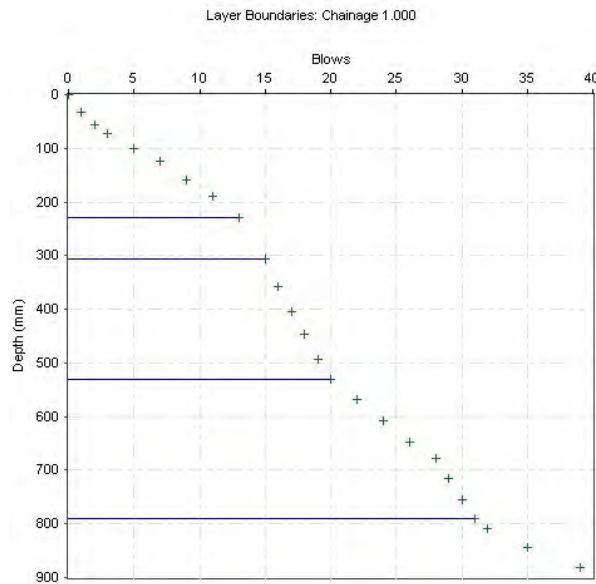
Report produced by

DCP Layer Strength Analysis Report

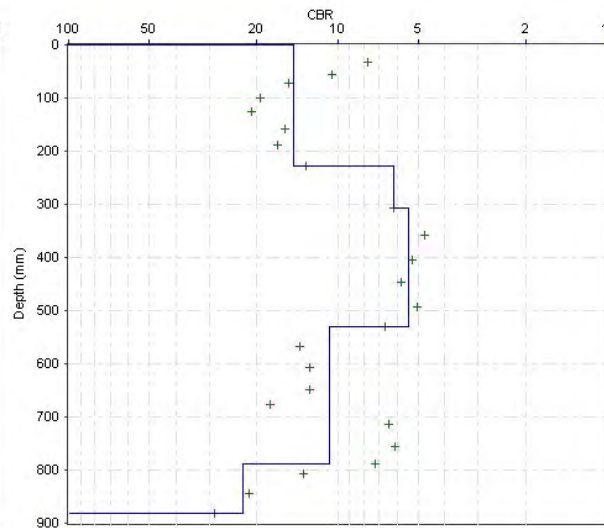
Project Name: GWPR4765 DCP4

Chainage (km): 1.000
 Direction:
 Location/Offset: Lay-by / other/1.00m
 Cone Angle: 60 degrees
 Zero Error (mm): 69
 Test Date: 24/06/2022

Surface Type: Unpaved
 Thickness (mm): 0
 Base Type:
 Thickness (mm):
 Surface Moisture: Unknown
 Moisture adjustment factor: Not adjusted



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)
1	17.54	15	228	228
2	39.50	6	79	307
3	44.80	5	224	531
4	23.45	11	258	789
5	11.63	23	93	882

CBR Relationship:

TRL equation: $\log_{10}(\text{CBR}) = 2.48 - 1.057 \times \log_{10}(\text{Strength})$

Report produced by

APPENDIX D: Geotechnical Laboratory Testing



Laboratory Report



GEO Site & Testing Services Ltd

Contract Number: 59727

Client Ref: **GWPR4765**

Report Date: **09-06-2022**

Client PO: **GWPR4765**

Client **Ground and Water Limited**
Unit 2, The Long Barn,
Norton Farm,
Selbourne Road,
Alton,
Hampshire
GU34 3NB

Contract Title: **Downlands Park Care Home, Bolnore Farm Lane, Haywards Heath, RH16 4BQ**
For the attention of: **Roger Foord**

Date Received: **26-05-2022**

Date Completed: **09-06-2022**

Test Description	Qty
Samples Received - @ Non Accredited Test	8
Moisture Content BS 1377:1990 - Part 2 : 3.2 - * UKAS	7
1 Point Liquid & Plastic Limit BS 1377:1990 - Part 2 : 4.4 & 5.3 - * UKAS	7
PSD Wet Sieve method BS 1377:1990 - Part 2 : 9.2 - * UKAS	1
Disposal of samples for job	1

Notes: Observations and Interpretations are outside the UKAS Accreditation

* - denotes test included in laboratory scope of accreditation

- denotes test carried out by approved contractor

@ - denotes non accredited tests

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved Signatories:

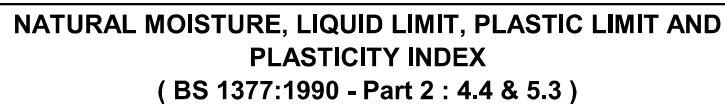
Emma Sharp (Business Support Manager) - Paul Evans (Director) - Richard John (Quality/Technical Manager)

Shaun Jones (Laboratory manager) - Shaun Thomas (Site Manager) - Wayne Honey (Quality Assistant / Administrator / Health and Safety Coordinator)

GEO Site & Testing Services Ltd

Unit 3-4, Heol Aur, Dafen Ind Estate, Dafen, Llanelli, Carmarthenshire SA14 8QN

Tel: 01554 784040 Fax: 01554 784041 info@gstl.co.uk gstl.co.uk



59727

Downlands Park Care Home, Bolnore Farm Lane, Haywards Heath, RH16 4BQ

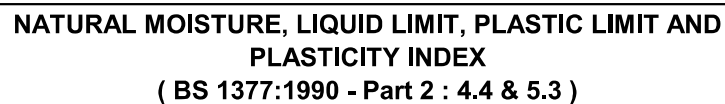
07/06/2022

DESCRIPTIONS

[illegible]

Operators	Checked	09/06/2022	Richard John (Advanced Testing Manager)
Clayton Jenkins	Approved	09/06/2022	Paul Evans (Quality/Technical Manager)



[illegible]

: Liquid Limit and Plastic Limit Wet Sieved

The Plasticity Chart (Figure 1) plots Plasticity Index (%) on the Y-axis (0 to 90) against Liquid Limit (%) on the X-axis (0 to 120). The chart is divided into five regions based on Liquid Limit: CL (0-30%), CI (30-40%), CH (40-60%), CV (60-80%), and CE (80-120%). A diagonal line separates the liquid limit regions (ML, MI, MH, MV, ME) from the plasticity index regions. Data points are plotted as black dots.

Liquid Limit (%)	Plasticity Index (%)	Region
0	0	ML
30	21	ML
45	29	MI
50	30	MI
55	41	MH
62	42	MH

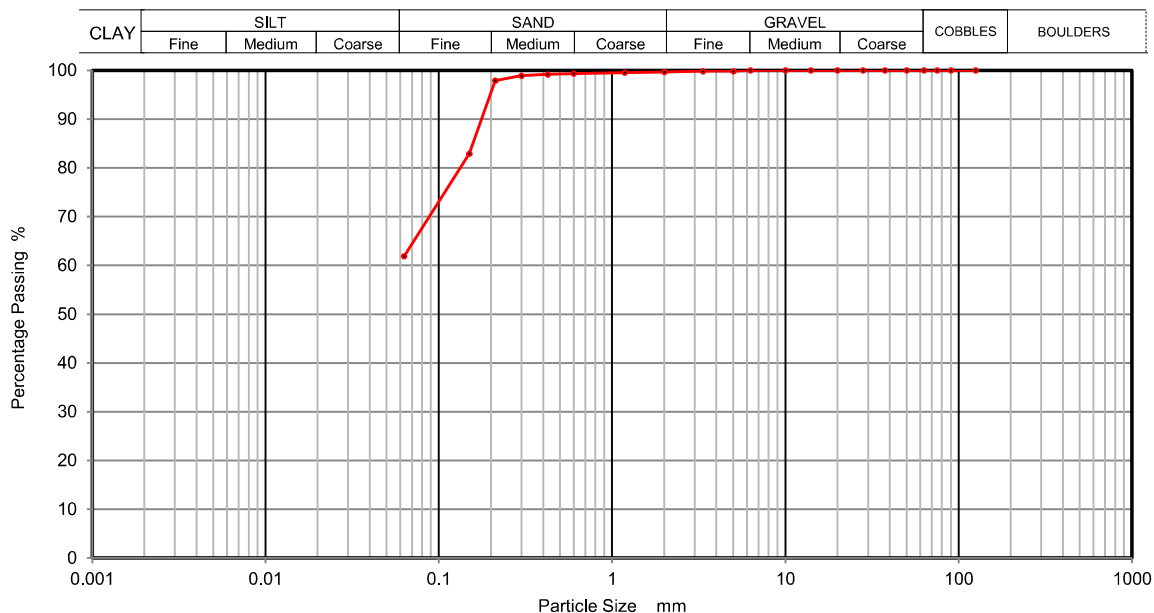




PARTICLE SIZE DISTRIBUTION
BS 1377 Part 2:1990
Wet Sieve, Clause 9.2

Contract Number	59727
	Borehole/Pit No.
TP7	Sample No.
Depth Top	1.00
Depth Base	
Sample Type	B

Site Name	Downlands Park Care Home, Bolnore Farm Lane, Haywards Heath, RH16 4BQ
Soil Description	Brown fine to coarse sandy SILT/CLAY
Date Tested	07/06/2022



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	99		
0.425	99		
0.3	99		
0.212	98		
0.15	83		
0.063	62		

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	38
Silt and Clay	62

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	08/06/2022	Richard John	
David	Approved	09/06/2022	Paul Evans	



APPENDIX E:

Chemical Laboratory Testing



Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: hawardencustomerservices@alsglobal.com
Website: www.alsenvironmental.co.uk

Ground and Water Ltd
Head Office
2 The Long Barn
Norton Farm, Selborne Road
Alton
Hampshire
GU34 3NB

Attention: Roger Foord

CERTIFICATE OF ANALYSIS

Date of report Generation:	26 May 2022
Customer:	Ground and Water Ltd
Sample Delivery Group (SDG):	220518-98
Your Reference:	GWPR4765
Location:	Downlands Park, Bolmore Farm Lane, Haywards Heath,
Report No:	648261
Order Number:	GWPR4765

We received 8 samples on Wednesday May 18, 2022 and 8 of these samples were scheduled for analysis which was completed on Thursday May 26, 2022. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden.

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.

Incorrect sampling dates and/or sample information will affect the validity of results.

The customer is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved By:

Sonia McWhan

Operations Manager





CERTIFICATE OF ANALYSIS

Validated

SDG: 220518-98
Client Ref.: GWPR4765

Report Number: 648261

Superseded Report:
Location: Downlands Park, Bolmore Farm Lane, Haywards Heath,

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
26299120	TP2		0.20	12/05/2022
26299162	TP2		1.00	12/05/2022
26299130	TP3		0.20	12/05/2022
26299166	TP3		2.00	12/05/2022
26299139	TP4		0.20	12/05/2022
26299144	TP5		0.20	12/05/2022
26299148	TP6		0.90	12/05/2022
26299155	TP8		0.20	12/05/2022

Only received samples which have had analysis scheduled will be shown on the following pages.



CERTIFICATE OF ANALYSIS

Validated

SDG: 220518-98
Client Ref.: GWPR4765

Report Number: 648261

Superseded Report:

Location: Downlands Park, Bolmore Farm Lane, Haywards Heath,

Results Legend X Test N No Determination Possible Sample Types - S - Soil/Solid UNS - Unspecified Solid GW - Ground Water SW - Surface Water LE - Land Leachate PL - Prepared Leachate PR - Process Water SA - Saline Water TE - Trade Effluent TS - Treated Sewage US - Untreated Sewage RE - Recreational Water DW - Drinking Water Non-regulatory UNL - Unspecified Liquid SL - Sludge G - Gas OTH - Other	Lab Sample No(s)		Customer Sample Reference		AGS Reference		Depth (m)		Container		Sample Type	
	26299155		TP8		0.20		250g Amber Jar (ALE210)		S			
	26299148		TP6		0.90		1kg TUB with Handle (ALE260)		S			
	26299144		TP5		0.20		250g Amber Jar (ALE210)		S			
	26299139		TP4		0.20		1kg TUB with Handle (ALE260)		S			
	26299166		TP3		2.00		250g Amber Jar (ALE210)		S			
26299130		TP3		0.20		1kg TUB with Handle (ALE260)		S				
26299162		TP2		1.00		1kg TUB with Handle (ALE260)		S				
26299120		TP2		0.20		60g VOC (ALE215)		S				
						250g Amber Jar (ALE210)		S				
						1kg TUB with Handle (ALE260)		S				
						1kg TUB with Handle (ALE260)		S				
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						250g Amber Jar (ALE210)		S				
						1kg TUB with Handle (ALE260)		S				
						250g Amber Jar (ALE210)		S				
						1kg TUB with Handle (ALE260)		S				
						250g Amber Jar (ALE210)		S				
						1kg TUB with Handle (ALE260)		S				
						250g Amber Jar (ALE210)		S				
						1kg TUB with Handle (ALE260)		S				
						250g Amber Jar (ALE210)		S				
						1kg TUB with Handle (ALE260)		S				
						250g Amber Jar (ALE210)		S				
						1kg TUB with Handle (ALE260)		S				
						250g Amber Jar (ALE210)		S				
						1kg TUB with Handle (ALE260)		S				
						250g Amber Jar (ALE210)		S				
						1kg TUB with Handle (ALE260)		S				
						250g Amber Jar (ALE210)		S				
						1kg TUB with Handle (ALE260)		S				
						250g Amber Jar (ALE210)		S				
						1kg TUB with Handle (ALE260)		S				
						250g Amber Jar (ALE210)		S				
						1kg TUB with Handle (ALE260)		S				
						250g Amber Jar (ALE210)		S				
						1kg TUB with Handle (ALE260)		S				
						250g Amber Jar (ALE210)		S				
						1kg TUB with Handle (ALE260)		S				



CERTIFICATE OF ANALYSIS

Validated

SDG: 220518-98
Client Ref.: GWPR4765

Report Number: 648261

Superseded Report:

Location: Downlands Park, Bolmore Farm Lane, Haywards Heath,

Results Legend



Test



No Determination Possible

Sample Types -

S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

Results Legend	Lab Sample No(s)		Customer Sample Reference		AGS Reference		Depth (m)		Container		Sample Type	
	26299155		TP8				0.20		250g Amber Jar (ALE210)	S		
	26299148		TP6				0.90		1kg TUB with Handle (ALE260)	S		
	26299144		TP5				0.20		250g Amber Jar (ALE210)	S		
	26299139		TP4				0.20		1kg TUB with Handle (ALE260)	S		
	26299166		TP3				2.00		250g Amber Jar (ALE210)	S		
Magnesium (BRE)	All	NDPs: 0 Tests: 2										
Mercury Dissolved	All	NDPs: 0 Tests: 1										
Metals in solid samples by OES	All	NDPs: 0 Tests: 5										
NO3, NO2 and TON by KONE (s)	All	NDPs: 0 Tests: 2										
PAH 16 & 17 Calc	All	NDPs: 0 Tests: 1										
PAH by GCMS	All	NDPs: 0 Tests: 6										
PCBs by GCMS	All	NDPs: 0 Tests: 1										
pH	All	NDPs: 0 Tests: 7										
Phenols by HPLC (S)	All	NDPs: 0 Tests: 5										
Phenols by HPLC (W)	All	NDPs: 0 Tests: 1										
Sample description	All	NDPs: 0 Tests: 8										
Total Dissolved Solids	All	NDPs: 0 Tests: 1										
Total Organic Carbon	All	NDPs: 0 Tests: 6										
Total Sulphate	All	NDPs: 0 Tests: 2										
Total Sulphur	All	NDPs: 0 Tests: 2										



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SDG: 220518-98
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Location: Downlands Park, Bolmore Farm Lane, Haywards Heath,

Superseded Report:

Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm
-----------	----------	------	-----------------	--------	-------------	--------	------------	-------------	-------

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Inclusions	Inclusions 2
26299120	TP2	0.20	Light Brown	Sandy Clay	None	None
26299162	TP2	1.00	Light Brown	Sandy Clay	Stones	None
26299130	TP3	0.20	Light Brown	Sandy Loam	Stones	Vegetation
26299166	TP3	2.00	Light Brown	Loamy Sand	Stones	None
26299139	TP4	0.20	Dark Brown	Clay Loam	Stones	Vegetation
26299144	TP5	0.20	Dark Brown	Clay Loam	Stones	Vegetation
26299148	TP6	0.90	Dark Brown	Clay Loam	Vegetation	Brick
26299155	TP8	0.20	Dark Brown	Clay Loam	Vegetation	None

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.



CERTIFICATE OF ANALYSIS

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Superseded Report:

Location: Downlands Park, Bolmore Farm Lane, Haywards Heath,

Results Legend			Customer Sample Ref.		TP2	TP2	TP3	TP3	TP4	TP5
# ISO17025 accredited. M mCERTS accredited. aq Aqueous / settled sample. diss.fltr Dissolved / filtered sample. tot.unfltr Total / unfiltered sample. * Subcontracted - refer to subcontractor report for accreditation status. ** % recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery (F) Trigger breach confirmed 1-4*5@ Sample deviation (see appendix)			Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference		0.20 Soil/Solid (S) 12/05/2022 00:00 18/05/2022 220518-98 26299120	1.00 Soil/Solid (S) 12/05/2022 00:00 18/05/2022 220518-98 26299162	0.20 Soil/Solid (S) 12/05/2022 00:00 18/05/2022 220518-98 26299130	2.00 Soil/Solid (S) 12/05/2022 00:00 18/05/2022 220518-98 26299166	0.20 Soil/Solid (S) 12/05/2022 00:00 18/05/2022 220518-98 26299139	0.20 Soil/Solid (S) 12/05/2022 00:00 18/05/2022 220518-98 26299144
Component	LOD/Units	Method								
Moisture Content Ratio (% of as received sample)	%	PM024	8.5		12		11		12	
Phenol	<0.01 mg/kg	TM062 (S)	<0.01	M			<0.01	M	<0.01	M
Cresols	<0.01 mg/kg	TM062 (S)	<0.01	M			<0.01	M	<0.01	M
Xylenols	<0.015 mg/kg	TM062 (S)	<0.015	M			<0.015	M	<0.015	M
Phenols, Total Detected monohydric	<0.035 mg/kg	TM062 (S)	<0.035	M			<0.035	M	<0.035	M
Organic Carbon, Total	<0.2 %	TM132	0.294	M			1.57	M	1.9	M
Sulphur, Total	<0.02 %	TM132			<0.02	#		<0.02	#	
Soil Organic Matter (SOM)	<0.35 %	TM132	0.507	#			2.71	#	3.28	#
pH	1 pH Units	TM133	7.57	M	7.57	M	8.43	M	7.09	M
Chromium, Hexavalent	<0.6 mg/kg	TM151	<0.6	#			<0.6	#	<0.6	#
Cyanide, Total	<1 mg/kg	TM153	<1	M			<1	M	<1	M
PCB congener 28	<0.003 mg/kg	TM168								<0.003
PCB congener 52	<0.003 mg/kg	TM168								<0.003
PCB congener 101	<0.003 mg/kg	TM168								<0.003
PCB congener 118	<0.003 mg/kg	TM168								<0.003
PCB congener 138	<0.003 mg/kg	TM168								<0.003
PCB congener 153	<0.003 mg/kg	TM168								<0.003
PCB congener 180	<0.003 mg/kg	TM168								<0.003
Sum of detected PCB 7 Congeners	<0.021 mg/kg	TM168								<0.021
Arsenic	<0.6 mg/kg	TM181	7.16	M			17.6	M	9.42	M
Cadmium	<0.02 mg/kg	TM181	<0.02	M			0.0329	M	0.14	M
Chromium	<0.9 mg/kg	TM181	5.44	M			<0.9	M	8.26	M
Copper	<1.4 mg/kg	TM181	9.85	M			16.9	M	28	M
Lead	<0.7 mg/kg	TM181	20.1	M			32.6	M	102	M
Mercury	<0.1 mg/kg	TM181	<0.1	M			<0.1	M	<0.1	M
Nickel	<0.2 mg/kg	TM181	7.17	M			11.8	M	12	M
Selenium	<1 mg/kg	TM181	<1	#			2.55	#	1.12	#
Vanadium	<0.2 mg/kg	TM181	32.4	#			20.1	#	25.6	#
Zinc	<1.9 mg/kg	TM181	40.4	M			35.1	M	108	M
Sulphate, acid soluble (total)	<0.0048 %	TM221			<0.0048	M		<0.0048	M	
Boron, water soluble	<1 mg/kg	TM222	1.12	M			<1	M	<1	M
Water Soluble Sulphate as SO4 2:1 Extract	<0.004 g/l	TM243	0.0161	M			0.0111	M	0.0127	M
Soluble Sulphate 2:1 extract as SO4 BRE	<0.004 g/l	TM243			0.0243	M		0.0294	M	

Validated



CERTIFICATE OF ANALYSIS

Validated

SDG: 220518-98
Client Ref.: GWPR4765

Report Number: 648261
Location: Downlands Park, Bolmore Farm Lane, Haywards Heath,

Superseded Report:

Asbestos Identification - Solid Samples

Results Legend

ISO17025 accredited.
M mCERIS accredited.
* Subcontracted test.
(F) Trigger breach confirmed
1-5&*%\$@ Sample deviation (see appendix)

		Date of Analysis	Analysed By	Comments	Amosite (Brown) Asbestos	Asbestos Actinolite	Asbestos Anthophyllite	Asbestos Tremolite	Chrysotile (White) Asbestos	Crocidolite (Blue) Asbestos	Non-Asbestos Fibre
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	TP2 0.20 SOLID 12/05/2022 00:00:00 18/05/2022 05:00:00 220518-98 26299120 TM048	25/05/2022	Emily Anderton	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	TP3 0.20 SOLID 12/05/2022 00:00:00 18/05/2022 05:00:00 220518-98 26299130 TM048	25/05/22	Eva Guerra	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	TP4 0.20 SOLID 12/05/2022 00:00:00 18/05/2022 05:00:00 220518-98 26299139 TM048	25/05/22	Eva Guerra	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	TP6 0.90 SOLID 12/05/2022 00:00:00 18/05/2022 05:00:00 220518-98 26299148 TM048	25/05/2022	Emily Anderton	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	TP8 0.20 SOLID 12/05/2022 00:00:00 18/05/2022 05:00:00 220518-98 26299155 TM048	25/05/2022	Emily Anderton	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected



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SDG: 220518-98
Client Ref.: GWPR4765

Report Number: 648261
Location: Downlands Park, Bolmore Farm Lane, Haywards Heath,

Superseded Report:

CEN 10:1 SINGLE STAGE LEACHATE TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference

Mass Sample taken (kg)	0.118
Mass of dry sample (kg)	0.090
Particle Size <4mm	>95%

Site Location

Natural Moisture Content (%)	31
Dry Matter Content (%)	76.3

Case

SDG	220518-98
Lab Sample Number(s)	26299144
Sampled Date	12-May-2022
Customer Sample Ref.	TP5
Depth (m)	0.20

Landfill Waste Acceptance Criteria Limits

Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
3	5	6
-	-	-
-	-	-
1	-	-
500	-	-
100	-	-
-	-	-
-	-	-
-	-	-

Solid Waste Analysis

Result

Total Organic Carbon (%)	2.13
Loss on Ignition (%)	-
Sum of BTEX (mg/kg)	-
Sum of 7 PCBs (mg/kg)	<0.021
Mineral Oil (mg/kg) (EH_2D_AL)	11.2
PAH Sum of 17 (mg/kg)	<10
pH (pH Units)	-
ANC to pH 6 (mol/kg)	-
ANC to pH 4 (mol/kg)	-

Eluate Analysis

C₂

Concⁿ in 10:1 eluate (mg/l)

A₂

10:1 concⁿ leached (mg/kg)

Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg

	Result	Limit of Detection	Result	Limit of Detection			
Arsenic	0.00171	<0.0005	0.0171	<0.005	0.5	2	25
Barium	0.173	<0.0002	1.73	<0.002	20	100	300
Cadmium	<0.00008	<0.00008	<0.0008	<0.0008	0.04	1	5
Chromium	<0.001	<0.001	<0.01	<0.01	0.5	10	70
Copper	0.00377	<0.0003	0.0377	<0.003	2	50	100
Mercury Dissolved (CVAf)	<0.00001	<0.00001	<0.0001	<0.0001	0.01	0.2	2
Molybdenum	<0.003	<0.003	<0.03	<0.03	0.5	10	30
Nickel	0.000736	<0.0004	0.00736	<0.004	0.4	10	40
Lead	0.000423	<0.0002	0.00423	<0.002	0.5	10	50
Antimony	<0.001	<0.001	<0.01	<0.01	0.06	0.7	5
Selenium	<0.001	<0.001	<0.01	<0.01	0.1	0.5	7
Zinc	0.0462	<0.001	0.462	<0.01	4	50	200
Chloride	<2	<2	<20	<20	800	15000	25000
Fluoride	<0.5	<0.5	<5	<5	10	150	500
Sulphate (soluble)	<2	<2	<20	<20	1000	20000	50000
Total Dissolved Solids	145	<5	1450	<50	4000	60000	100000
Total Monohydric Phenols (W)	<0.016	<0.016	<0.16	<0.16	1	-	-
Dissolved Organic Carbon	7.49	<3	74.9	<30	500	800	1000

Leach Test Information

Date Prepared	18-May-2022
pH (pH Units)	8.08
Conductivity (µS/cm)	190.00
Temperature (°C)	20.20
Volume Leachant (Litres)	0.872

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALS Environmental cannot be held responsible for any discrepancies with current legislation

26/05/2022 16:36:12

16:35:57 26/05/2022



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SDG: 220518-98
Client Ref.: GWPR4765

Report Number: 648261
Location: Downlands Park, Bolmore Farm Lane, Haywards Heath,

Superseded Report:

Table of Results - Appendix

Method No	Reference	Description
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material
PM115		Leaching Procedure for CEN One Stage Leach Test 2:1 & 10:1 1 Step
TM048	HSG 248, Asbestos: The analysts' guide for sampling, analysis and clearance procedures	Identification of Asbestos in Bulk Material
TM062 (S)	National Grid Property Holdings Methods for the Collection & Analysis of Samples from National Grid Sites version 1 Sec 3.9	Determination of Phenols in Soils by HPLC
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) by Headspace GC-FID (C4-C12)
TM090	Method 5310, AWWA/APHA, 20th Ed., 1999 / Modified: US EPA Method 415.1 & 9060	Determination of Total Organic Carbon/Total Inorganic Carbon in Water and Waste Water
TM104	Method 4500F, AWWA/APHA, 20th Ed., 1999	Determination of Fluoride using the Kone Analyser
TM116	Modified: US EPA Method 8260, 8120, 8020, 624, 610 & 602	Determination of Volatile Organic Compounds by Headspace / GC-MS
TM123	BS 2690: Part 121:1981	The Determination of Total Dissolved Solids in Water
TM132	In - house Method	ELTRA CS800 Operators Guide
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter
TM151	Method 3500D, AWWA/APHA, 20th Ed., 1999	Determination of Hexavalent Chromium using Kone analyser
TM152	ISO 17294-2:2016 Water quality - Application of inductively coupled plasma mass spectrometry (ICP-MS)	Analysis of Aqueous Samples by ICP-MS
TM153	Method 4500A,B,C, I, M AWWA/APHA, 20th Ed., 1999	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate using the Skalar SANS+ System Segmented Flow Analyser
TM168	EPA Method 8082, Polychlorinated Biphenyls by Gas Chromatography	Determination of WHO12 and EC7 Polychlorinated Biphenyl Congeners by GC-MS in Soils
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers
TM218	Shaker extraction - EPA method 3546.	The determination of PAH in soil samples by GC-MS
TM221	Inductively Coupled Plasma - Atomic Emission Spectroscopy. An Atlas of Spectral Information: Winge, Fassel, Peterson and Floyd	Determination of Acid Extractable Sulphate in Soils by ICP OES
TM222	In-House Method	Determination of Hot Water Soluble Boron in Soils (10:1 Water:Soil) by ICP OES.
TM243		Mixed Anions In Soils By Kone
TM248	In-House Method	Determination of Ammonium BRE (2:1 Extract) on solids
TM259	by HPLC	Determination of Phenols in Waters and Leachates by HPLC
TM282		Extraction of Magnesium by BRE Method
TM410	Shaker extraction-In house coronene method	Determination of Coronene in soils by GCMS
TM414	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GCxGC-FID
TM415	Analysis of Petroleum Hydrocarbons in Environmental Media.	Determination of Extractable Petroleum Hydrocarbons in Soils by GCxGC-FID

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden.



CERTIFICATE OF ANALYSIS

Validated

SDG: 220518-98
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Location: Downlands Park, Bolmore Farm Lane, Haywards Heath,

Superseded Report:

Test Completion Dates

Lab Sample No(s)	26299120	26299162	26299130	26299166	26299139	26299144	26299148	26299155
Customer Sample Ref.	TP2	TP2	TP3	TP3	TP4	TP5	TP6	TP8
AGS Ref.								
Depth	0.20	1.00	0.20	2.00	0.20	0.20	0.90	0.20
Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
Ammoniacal N as NH4 in 2:1 extract		19-May-2022		19-May-2022				
Anions by Kone (soil)	24-May-2022	24-May-2022	24-May-2022	24-May-2022	24-May-2022		24-May-2022	24-May-2022
Anions by Kone (w)						23-May-2022		
Asbestos ID in Solid Samples	25-May-2022		25-May-2022		25-May-2022		25-May-2022	25-May-2022
Boron Water Soluble	23-May-2022		25-May-2022		25-May-2022		23-May-2022	25-May-2022
CEN 10:1 Leachate (1 Stage)						19-May-2022		
CEN Readings						23-May-2022		
Coronene						20-May-2022		
Cyanide Comp/Free/Total/Thiocyanate	20-May-2022		20-May-2022		20-May-2022		20-May-2022	20-May-2022
Dissolved Metals by ICP-MS						24-May-2022		
Dissolved Organic/Inorganic Carbon						24-May-2022		
EPH by GCxGC-FID						23-May-2022		
EPH CWG GC (S)	20-May-2022						23-May-2022	
Fluoride						24-May-2022		
GRO by GC-FID (S)	26-May-2022						26-May-2022	
Hexavalent Chromium (s)	19-May-2022		21-May-2022		21-May-2022		21-May-2022	21-May-2022
Magnesium (BRE)		23-May-2022		23-May-2022				
Mercury Dissolved						24-May-2022		
Metals in solid samples by OES	20-May-2022		24-May-2022		23-May-2022		23-May-2022	24-May-2022
Moisture at 105C						18-May-2022		
NO3, NO2 and TON by KONE (s)		24-May-2022		24-May-2022				
PAH 16 & 17 Calc						20-May-2022		
PAH by GCMS	20-May-2022		20-May-2022		20-May-2022	20-May-2022	20-May-2022	20-May-2022
PCBs by GCMS						24-May-2022		
pH	24-May-2022	23-May-2022	24-May-2022	23-May-2022	24-May-2022		24-May-2022	24-May-2022
Phenols by HPLC (S)	20-May-2022		20-May-2022		20-May-2022		20-May-2022	20-May-2022
Phenols by HPLC (W)						24-May-2022		
Sample description	18-May-2022	18-May-2022	18-May-2022	18-May-2022	18-May-2022	18-May-2022	18-May-2022	18-May-2022
Total Dissolved Solids						24-May-2022		
Total Organic Carbon	25-May-2022		25-May-2022		25-May-2022	25-May-2022	25-May-2022	25-May-2022
Total Sulphate		24-May-2022		23-May-2022				
Total Sulphur		24-May-2022		25-May-2022				
TPH CWG GC (S)	26-May-2022						26-May-2022	
VOC MS (S)	25-May-2022					26-May-2022	25-May-2022	



CERTIFICATE OF ANALYSIS

SDG: 220518-98
Client Ref: GWPR4765

Report Number: 648261
Location: Downlands Park, Bolmore Farm Lane, Haywards Heath,
Superseded Report:

Appendix

General

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH₄ by the BRE method, VOC TICs and SVOC TICs.

2. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

3. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

4. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

5. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

6. NDP - No determination possible due to insufficient/unsuitable sample.

7. Results relate only to the items tested.

8. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

9. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

10. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

11. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

12. For dried and crushed preparations of soils volatile loss may occur e.g volatile mercury.

13. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

14. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

15. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

16. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

17 Data retention. All records, communications and reports pertaining to the analysis are archived for seven years from the date of issue of the final report.

18. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as "mixed hydrocarbons". Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

19. Sample Deviations

If a sample is classed as deviated then the associated results may be compromised.

1	Container with Headspace provided for volatiles analysis
2	Incorrect container received
3	Deviation from method
4	Matrix interference
♦	Sample holding time exceeded in laboratory
@	Sample holding time exceeded due to late arrival of instructions or samples
§	Sampled on date not provided

20. Asbestos

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2021), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials and soils are obtained from supplied bulk materials and soils which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2021).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Respirable Fibres

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

APPENDIX F:

Soil Assessment Criteria

Ground and Water Limited

Soil Guideline Values and Generic Assessment Criteria

The Contaminated Land Regime reflects the UK Government's stated objectives of achieving sustainable development through the 'suitable for use approach'. At preliminary risk assessment stage, risks are evaluated qualitatively. As the site investigation progresses to a generic or detailed quantitative risk assessment, data is collected and assessment criteria are utilised to evaluate whether the contaminants represent an unacceptable risk to the identified receptors.

1. Contaminated Land Exposure Assessment Model (CLEA)

Current United Kingdom risk assessment practice is based on the Contaminated Land Exposure Assessment Model (CLEA).

The CLEA Guidance comprises the following documents:

- 1) EA Science Report SC050021/SR2: Human health toxicological assessment of contaminants in soil.
- 2) EA Science Report SC050021/SR3: Updated technical background to the CLEA model.
- 3) EA CLEA Bulletin (2009).
- 4) CLEA software version 1.06 (2009)
- 5) Toxicological reports and SGV technical notes.

The CLEA guidance and tools:

- Do not cover other types of risk to humans, such as fire, suffocation or explosion, or short-term and acute exposures;
- Do not cover risks to the environment, such as groundwater, ecosystems or buildings;
- Do not provide a definitive test for telling when human health risks are significant; and
- Are not a legal requirement in assessing land contamination risks. They are not part of the legal regime for Part 2A of the Environmental Protection Act 1990.

The CLEA guidance derives soil concentrations of contaminants above which (in the opinion of the EA) there may be a concern that warrants further investigation. It does not provide a definitive test for establishing that the risk is significant.

1.1. Land-use Scenarios

The CLEA model uses a range of standard land-use scenarios to develop conceptual exposure models outlined in the following sections.

1.1.1. Residential (with home grown produce) (RwHP)

Generic scenario assumes a typical two-storey house built on a ground bearing slab with a private garden having a lawn, flowerbeds and a small fruit and vegetable patch.

- Critical receptor is a young female child (zero to six years old)
- Exposure duration is six years.
- Exposure pathways include direct soil and indoor dust ingestion, consumption of homegrown produce and any adhering soil, skin contact with soils and indoor dust and inhalation of indoor and outdoor dust and vapours.
- Building type is a two-storey small-terraced house.

A sub-set of this land-use is residential apartments with communal landscaped gardens where the consumption of home grown vegetables will not occur. (Residential without homegrown produce (RwoHP)).

1.1.2. Allotments

Provision of open space (about 250sq.m) commonly made available to tenants by the local authority to grow fruit and vegetable for their own consumption. Typically, there are a number of plots to a site which may have a total area of up to 1 hectare. The tenants are assumed to be adults and that young children make occasional accompanied visits.

Although some allotment holders may choose to keep animals including rabbits, hens, and ducks, potential exposure to contaminated meat and eggs is not considered.

- Critical receptor is a young female child (zero to six years old)
- Exposure duration is six years.
- Exposure pathways include direct soil ingestion, consumption of homegrown produce and any adhering soil, skin contact with soils and inhalation of outdoor dust and vapours.
- There is no building.

1.1.3. Commercial/Industrial

The generic scenario assumes a typical commercial or light industrial property comprising a three-storey building at which employees spend most time indoors and are involved in office-based or relatively light physical work.

- Critical receptor is a working female adult (aged 16 to 65 years old).
- Exposure duration is a working lifetime of 49 years.
- Exposure pathways include direct soil and indoor dust ingestion, skin contact with soils and dusts and inhalation of dust and vapours.
- Building type is a three-storey office (pre 1970).

2. LQM/CIEH Suitable 4 Use Levels (S4UL)

For derivation of these S4UL reference must be made to:

Nathanial, P., McCaffrey, C., Gillet, A., Ogden, R., Nathanial, J., *The LQM/CIEH S4UL's for Human Health Risk Assessment*. Land Quality Press. 2015

2.1. S4UL Background

The Land Quality Management/Chartered Institute of Environmental Health (LQM/CIEH) S4UL for a given land use is the concentration of the contaminant in soil at which the predicted daily exposure,

as calculated by the CLEA software, equals the Health Criteria Value. The S4ULs have been derived for substances based on various generic land use and soil organic matter contents.

The final output for each contaminant represents a synthesis of new toxicological (and fate and transport) reviews published since the preparation of the 2nd edition LQM/CIEH GAC's (Nathanial et al., 2009).

In the derivation of LQM/CIEH S4UL's the principles of 'minimal' or 'tolerable' risk enshrined in SR2, which has not been withdrawn, has been maintained.

2.2. S4UL Land-use

S4UL's have been derived for the basic CLEA land-uses, as described in section 1.2, and for two new land uses:

- Public Open Spaces near Residential Housing (POSresi).
- Public Park (POSpark).

2.2.1. Public Open Spaces near Residential Housing (POSresi)

Includes the predominantly grassed areas adjacent to high density housing, the central green area on many 1930's – 1970's housing estates, and smaller areas commonly incorporated in newer developments as informal grassed areas or more formal landscaped areas with a mixture of open space and covered soils with planting. It is assumed that the close proximity to the place of residence will allow tracking back of soil to occur.

2.2.2. Public Park (POSpark)

An area of open space, usually owned and maintained by the local authority, provided for recreational uses including family visits and picnics, children's play area, informal sporting activities (not a dedicated sports pitch), and dog walking. It is assumed that tracking back of soils into places of residence will be negligible.

The following LQM/CIEH S4ULs (Copyright Land Quality Management Limited) have been reproduced with permission, to the publication number S4UL3072.

3. Category 4 Screening Levels (C4SLs)

In the case of Lead, no SGV or GAC has been published to date. This is likely to be due to the toxicity review that is currently being undertaken by the Environment Agency. In the absence of updated toxicity information the SGV derived using CLEA 1.06 methodology and related toxicity will be used.

The overall objective of the C4SLs research project was to assist the provision of technical guidance in support of Defra's revised Statutory Guidance (SG) for Part 2A of the Environmental Protection Act 1990 (Part 2A) (Defra, 2012a). Specifically, the project aimed to deliver:

- A methodology for deriving C4SLs for four generic land-uses comprising residential, commercial, allotments and public open space; and
- A demonstration of the methodology, via the derivation of C4SLs for six substances – arsenic, benzene, benzo(a)pyrene, cadmium, chromium (VI) and lead.

To help achieve a more targeted approach to identifying and managing contaminated land in relation to the risk (or possibility) of harm to human health, the revised SG presented a new four category

system for considering land under Part 2A, ranging from Category 4, where there is no risk that land poses a significant possibility of significant harm (SPOSH), or the level of risk is low, to Category 1, where the risk that land poses a significant possibility of significant harm (SPOSH) is unacceptably high. More specific guidance on what type of land should be considered as Category 4 (Human Health) is provided in Paragraphs 4.21 and 4.22 of the revised SG, as follows:

“4.21 The local authority should consider that the following types of land should be placed into Category 4: Human Health:

(a) Land where no relevant contaminant linkage has been established.

(b) Land where there are only normal levels of contaminants in soil, as explained in Section 3 of this Guidance.

(c) Land that has been excluded from the need for further inspection and assessment because contaminant levels do not exceed relevant generic assessment criteria in accordance with Section 3 of this Guidance, or relevant technical tools or advice that may be developed in accordance with paragraph 3.30 of this Guidance.

(d) Land where estimated levels of exposure to contaminants in soil are likely to form only a small proportion of what a receptor might be exposed to anyway through other sources of environmental exposure (e.g. in relation to average estimated national levels of exposure to substances commonly found in the environment, to which receptors are likely to be exposed in the normal course of their lives).

4.22 The local authority may consider that land other than the types described in paragraph 4.21 should be placed into Category 4: Human Health if following a detailed quantitative risk assessment it is satisfied that the level of risk posed is sufficiently low.”

The C4SLs are intended as “relevant technical tools” (in relation to Paragraph 4.21(c)) to help local authorities and others when deciding to stop further assessment of a site, on the grounds that it falls within Category 4 (Human Health).

The Impact Assessment (IA), which accompanied the revised SG (Defra, 2012b) provides further information on the nature and potential role of the C4SLs. Paragraph 47(h) of the IA states that:

“The new statutory guidance will bring about a situation where the current SGVs/GACs are replaced with more pragmatic (but still strongly precautionary) Category 4 screening levels (C4SLs) which will provide a higher simple test for deciding that land is suitable for use and definitely not contaminated land.”

A key distinction between the Soil Guideline Values (SGVs) and the C4SLs is the level of risk that they describe. As described by the Environment Agency (2009a):

“SGVs are guidelines on the level of long-term human exposure to individual chemicals in soil that, unless stated otherwise, are tolerable or pose a minimal risk to human health.”

The implication of Paragraph 47(h) of the IA is that minimal risk is well within Category 4 and that the C4SLs should describe a higher level of risk which, whilst not minimal, can still be considered low enough to allow a judgement to be made that land containing substances at, or below, the C4SLs would typically fall within Category 4. This reflects Paragraph 4.20 of the revised SG, which states:

“4.20 The local authority should not assume that land poses a significant possibility of significant harm if it considers that there is no risk or that the level of risk posed is low. For the purposes of this Guidance, such land is referred to as a “Category 4: Human Health” case. The authority may decide that the land is a Category 4: Human Health case as soon as it considers it has evidence to this effect, and this may happen at any stage during risk assessment including the early stages.”

C4SLs, therefore, should not be viewed as “SPOSH levels” and they should not be used as a legal trigger for the determination of land under Part 2A.

The generic screening values referred to before usually take the form of risk-based Soil Guideline Values (SGVs) or other Generic Assessment Criteria (GACs) that are most typically derived using the Environment Agency’s Contaminated Land Exposure Assessment (CLEA) model, as described in the Environment Agency’s SR2, SR3 and SR7 reports (EA, 2009b & c; EA, 2008). It is anticipated that C4SLs will be used in a similar manner; as generic screening criteria that can be used within a GQRA, albeit describing a higher level of risk than the SGVs.

The suggested approach to the development of C4SLs consists of the retention and use of the CLEA framework, modified according to considerations of the underlying science within the context of Defra’s policy objectives relating to the revised SG. Within this context, it is suggested that the development of C4SLs may be achieved in one of three ways, namely:

- By modifying the toxicological parameters used within CLEA (while maintaining current exposure parameters);
- By modifying the exposure parameters embedded within CLEA (while maintaining current toxicological “minimal risk” interpretations); and
- By modifying both toxicological and exposure parameters.

There is also a suggested check on “other considerations” (e.g., background levels, epidemiological data, sources of uncertainty) within the approach, applicable to all three options.

It is suggested that a new term is defined for the toxicological guidance values associated with the derivation of C4SLs – a Low Level of Toxicological Concern (LLTC). A LLTC should represent an intake of low concern that remains suitably protective of health, and definitely does not approach an intake level that could be defined as SPOSH.

4. CL:AIRE Generic Assessment Criteria (GAC)

For derivation of the CL:AIRE Generic Assessment Criteria (GAC) reference should be made to the following report:

CL:AIRE, *The Soil Generic Assessment Criteria for Human Health Risk Assessment. Contaminated Land: Applications in the Real Environment*. 2009.

Within this report, Contaminated Land: Applications in Real Environments (CL:AIRE) provided Generic Assessment Criteria (GAC) in accordance with the CLEA software and the principles outlined previously for a further 35 contaminants sometimes encountered on land affected by contamination.

5. SoBRA Acute GAC

The Society of Brownfield Risk Assessment (SoBRA) identified that most human health risk assessments focus on the chronic risks arising from long-term exposure to specific substances. As chronic risks often occur at lower doses than acute risks, they are often the key drivers, however, in some instances the acute dose may also be an important consideration within risk assessments.

The methodology for deriving the acute GAC were related to two distinct receptor groups:

- Members of the public, where the 'critical' receptor for this group will typically be a female child, which is consistent with CLEA residential and Public Open Space/allotments land-uses;
- Workers involved with excavations. The critical receptor for this group is assumed to be a female working adult, without the use of PPE.

The acute GACs relate to short term exposure of high concentrations of a substance that lead to acute effects. They are not considered to be average exposures across a specific / defined area. As a result, the GACs should be normally be compared with the maximum likely concentration that the individual may be exposed to, and not the average concentration within a specific area.

The SoBRA acute GAC will primarily be used for contaminants that do not currently have any GAC, most notably Cyanide.

6. Detailed Quantitative Risk Assessments (DQRA)

Where the adoption of a GAC is not appropriate, for instance when the intended land-use is at variance the CLEA standard land-uses, then a DQRA may be undertaken to develop site specific values for relevant soil contaminants.

- | |
|---|
| <ul style="list-style-type: none">▪ Establishing the plausibility that generic exposure pathways exist in practice by measurement and observation.▪ Developing more accurate parameters using site data. |
|---|

7. Phytotoxicity

CLEA guidance only addresses human health toxicity; assessment of plant toxicity (phytotoxicity) is based on threshold trigger values obtained from the following source:

- ICRL 70/90: Notes on the restoration and aftercare of metalliferous mining sites for pasture and grazing.

8. Statistical Tests

DEFRA R&D Publication CLR 7 (DOE 1994) addressed the statistical treatment of test results and their comparison to Soil Guideline Values.

Consideration must be given to the appropriate area of land to be considered termed the critical averaging area.

For a communal open space or commercial land-use, the critical averaging area will depend on the proposed layout. For a residential use with private gardens the averaging area is the individual plot.

It may be appropriate to compare the upper 95th percentile concentration with the Soil Guideline Value, subject to applying a statistical test to establish that the range of concentrations are reasonably consistent and belonging to the same underlying distribution of data.

CL:AIRE published guidance in 2020, *Guidance in comparing soil contamination data with a critical concentration*, superseding the CL:AIRE/CIEH 2008 report of the same name. The guidance provides ways to assist land contamination stakeholders to apply statistical methods to their data to enable decisions under the legislative framework; either planning system or Part 2A of the Environmental Protection Act 1990.

The use of the statistical tests should only be applied if the following statements are valid for the datasets:

- Averaging areas, as well as the smallest area of concern have been identified on the basis of the CSM, including the desk study and/or the site walkover;
- The sample locations were chosen using a simple random, stratified random or stratified systematic (square, herringbone or triangular grid) sampling pattern, rather than being targeted to locations suspected of being contaminated;
- The sample locations are relatively evenly spread across the area and are not clustered, to avoid giving undue weight to some parts of the site over others in the calculated statistics;
- The analyses do not suggest a hotspot or outlier of contamination that should be treated as a separate zone. This has been established by a histogram and/or a names statistical test;
- The sample locations are all taken from one population (i.e. the same material);
- Where an averaging zone encompasses several averaging areas, analyses do not show a spatial trend or other spatial pattern across that zone; and
- The number of samples has been shown to be sufficient for a statistical analysis.

Any included statistical spreadsheet is based on an in-house method of statistical analysis, in line with those outlined within the CL:AIRE guidance (2020).

Treatment of Hot-Spots

- A statistical test is applied to establish whether the data is a part of a single set, or whether data outliers are present.
- Provided that the data is based on random sampling and no distinct contamination source was present at the sampling location, the hot-spot(s) may be excluded and the mean of the remaining data assessed.

9. Ground and Water Limited Soil Assessment Criteria

The Soil Assessment Criteria used in the preparation of the Generic Quantitative Risk Assessment are tabulated in the following pages, where the source of each has been outlined in the previous sections.

9.1. Inorganics

SoBRA – Acute Generic Assessment Criteria						
Determinand	RwHP (mg/kg)	RwoHP (mg/kg)	Allotment (mg/kg)	Commercial (mg/kg)	POSresi (mg/kg)	POSpark (mg/kg)
Cyanide	24	24	24	1400	24	24

9.2. Metals

C4SL Low Level of Toxicological Concern						
Determinand	RwHP (mg/kg)	RwoHP (mg/kg)	Allotment (mg/kg)	Commercial (mg/kg)	POSresi (mg/kg)	POSpark (mg/kg)
Lead	< 200	< 310	< 80	< 2300	< 630	< 1300

LQM/CIEH Suitable 4 Use Levels – Metals and Semi-metals						
Determinand	RwHP (mg/kg)	RwoHP (mg/kg)	Allotment (mg/kg)	Commercial (mg/kg)	POSresi (mg/kg)	POSpark (mg/kg)
Arsenic	37	40	43	640	79	170
Beryllium	1.7	1.7	35	12	2.2	63
Boron	290	11000	45	240000	21000	46000
Cadmium	11	85	1.9	190	120	532
Chromium (III)	910	910	18000	8600	1500	33000
Chromium (VI)	6	6	1.8	33	7.7	220
Copper	2400	7100	520	68000	12000	44000
Elemental Mercury	1.2	1.2	21	58	16	30
Inorganic Mercury	40	56	19	1100	120	240
Methylmercury	11	15	6	320	40	68
Nickel	180	180	53	980	230	800
Selenium	250	430	88	12000	1100	1800
Vanadium	410	1200	91	9000	2000	5000
Zinc	3700	40000	620	730000	81000	170000

Phytotoxicity (Harmful to Plants) Threshold Trigger Values	
Copper	250mg/kg
Zinc	1000mg/kg
Notes: Phytotoxicity Recommendations – ICRL 70/90 <i>Restoration of metalliferous mining areas</i> Many cultivars and specifically grasses have a high tolerance and there will be no ill-effect at the threshold trigger values given for neutral or near neutral pH. Site observation of plant vitality may give additional guidance.	

CL:AIRE Soil Generic Assessment Criteria				
Determinand	Residential (mg/kg)	Residential without plant uptake (mg/kg)	Allotment (mg/kg)	Commercial (mg/kg)
Antimony	ND	550	ND	7500
Barium	ND	1300	ND	22000
Molybdenum	ND	670	ND	17000
ND – Not derived				

9.3. Total Petroleum Hydrocarbons (TPHs)

9.3.1. BTEX Compounds

LQM/CIEH Suitable 4 Use Levels – BTEX Compounds							
Determinand	Soil Organic Matter	RwHP (mg/kg)	RwoHP (mg/kg)	Allotment (mg/kg)	Commercial (mg/kg)	POSresi (mg/kg)	POSpark (mg/kg)
Benzene	1.0% SOM	0.087	0.38	0.017	27	72	90
	2.5% SOM	0.170	0.70	0.034	47	72	100
	6.0% SOM	0.370	1.40	0.075	90	73	110
Toluene	1.0% SOM	130	880	22	56000	56000	87000
	2.5% SOM	290	1900	51	110000	56000	95000
	6.0% SOM	660	3900	120	180000	56000	100000
Ethylbenzene	1.0% SOM	47	83	16	5700	24000	17000
	2.5% SOM	110	190	39	13000	24000	22000
	6.0% SOM	260	440	91	27000	25000	27000
o-Xylene	1.0% SOM	60	88	28	6600	41000	17000
	2.5% SOM	140	210	67	15000	42000	24000
	6.0% SOM	330	480	160	33000	43000	33000
m-Xylene	1.0% SOM	59	82	31	6200	41000	17000
	2.5% SOM	140	190	74	14000	42000	24000
	6.0% SOM	320	450	170	31000	43000	33000
p-Xylene	1.0% SOM	56	79	29	5900	41000	17000
	2.5% SOM	130	180	69	14000	42000	23000
	6.0% SOM	310	430	160	30000	43000	31000

SOM = Soil Organic Matter Content (%)

9.3.2. Total Petroleum Hydrocarbons – Aliphatic

LQM/CIEH Suitable 4 Use Levels For TPH							
Aliphatic		RwHP (mg/kg)	RwoHP (mg/kg)	Allotment (mg/kg)	Commercial (mg/kg)	POSresi (mg/kg)	POSpark (mg/kg)
EC 5-6	1.0% SOM	42	42	730	3,200 (304) sol	570,000 (304) sol	95,000 (304) sol
	2.5% SOM	78	78	1,700	5,900 (558) sol	590,000	130,000 (558) sol
	6.0% SOM	160	160	3,900	12,000 (1150) sol	600,000 (1150) sol	180,000 (1150) sol
EC >6-8	1.0% SOM	100	100	2,300	7,800 (144) sol	600,000	150,000 (144) sol
	2.5% SOM	230	230	5,600	17,000 (322) sol	610,000	220,000 (322) sol
	6.0% SOM	530	530	13,000	40,000 (736) sol	620,000	320,000 (736) sol
EC >8-10	1.0% SOM	27	27	320	2,000 (78) sol	13,000	14,000 (78) sol
	2.5% SOM	65	65	770	4,800 (118) vap	13,000	18,000 (118) vap
	6.0% SOM	150	150	1,700	11,000 (451) vap	13,000	21,000 (451) vap
EC >10-12	1.0% SOM	130 (48) vap	130 (48) vap	2,200	9,700 (48) sol	13,000	21,000 (48) sol
	2.5% SOM	330 (118) vap	330 (118) vap	4,400	23,000 (118) vap	13,000	23,000 (118) vap
	6.0% SOM	760 (283) vap	760 (283) vap	7,300	47,000 (283) vap	13,000	24,000 (283) vap
EC >12-16	1.0% SOM	1,100 (24) sol	1,100 (24) sol	11,000	59,000 (24) sol	13,000	25,000 (24) sol
	2.5% SOM	2,400 (59) sol	2,400 (59) sol	13,000	82,000 (59) sol	13,000	25,000 (59) sol
	6.0% SOM	4,300 (142) sol	4,400 (142) sol	13,000	90,000 (142) sol	13,000	26,000 (142) sol
EC >16-35	1.0% SOM	65,000 (8.48) sol	65,000 (8.48) sol	260,000	1,600,000	250,000	450,000
	2.5% SOM	92,000 (21) sol	92,000 (21) sol	270,000	1,700,000	250,000	480,000
	6.0% SOM	110,000	110,000	270,000	1,800,000	250,000	490,000
EC >35-44	1.0% SOM	65,000 (8.48) sol	65,000 (8.48) sol	260,000	1,600,000	250,000	450,000
	2.5% SOM	92,000 (21) sol	92,000 (21) sol	270,000	1,700,000	250,000	480,000
	6.0% SOM	110,000	110,000	270,000	1,800,000	250,000	490,000

SOM = Soil Organic Matter Content (%)

vap – GAC presented exceeds the vapour saturation limit, which is presented in brackets.

sol – GAC presented exceeds the soil saturation limit, which is presented in brackets.

9.3.3. Total Petroleum Hydrocarbons – Aromatic

LQM/CIEH Suitable 4 Use Levels For TPH							
Aromatic		RwHP (mg/kg)	RwoHP (mg/kg)	Allotment (mg/kg)	Commercial (mg/kg)	POSresi (mg/kg)	POSpark (mg/kg)
EC 5-7 (Benzene)	1.0% SOM	70	370	13	26,000 (1220) ^{sol}	56,000	76,000 (1220) ^{sol}
	2.5% SOM	140	690	27	46,000 (2260) ^{sol}	56,000	84,000 (2260) ^{sol}
	6.0% SOM	300	1,400	57	86,000 (4710) ^{sol}	56,000	92,000 (4710) ^{sol}
EC >7-8 (Toluene)	1.0% SOM	130	860	22	56,000 (869) ^{vap}	56,000	87,000 (869) ^{sol}
	2.5% SOM	290	1,800	51	110,000 (1920) ^{sol}	56,000	95,000 (1920) ^{sol}
	6.0% SOM	660	3,900	120	180,000 (4360) ^{vap}	56,000	100,000 (4360) ^{vap}
EC >8-10	1.0% SOM	34	47	8.6	3,500 (613) ^{vap}	5,000	7,200 (613) ^{vap}
	2.5% SOM	83	110	21	8,100 (1500) ^{vap}	5,000	8,500 (1500) ^{vap}
	6.0% SOM	190	270	51	17,000 (3850) ^{vap}	5,000	9,300 (3580) ^{vap}
EC >10-12	1.0% SOM	74	250	13	16,000 (364) ^{sol}	5,000	9,200 (364) ^{sol}
	2.5% SOM	180	590	31	28,000 (899) ^{sol}	5,000	9,700 (889) ^{sol}
	6.0% SOM	380	1,200	74	34,000 (2150) ^{sol}	5,000	10,000
EC >12-16	1.0% SOM	140	1,800	23	36,000 (169) ^{sol}	5,100	10,000
	2.5% SOM	330	2,300 (419) ^{sol}	57	37,000	5,100	10,000
	6.0% SOM	660	2,500	130	38,000	5,000	10,000
EC >16-21	1.0% SOM	260	1,900	46	28,000	3,800	7,600
	2.5% SOM	540	1,900	110	28,000	3,800	7,700
	6.0% SOM	930	1,900	260	28,000	3,800	7,800
EC >21-35	1.0% SOM	1,100	1,900	370	28,000	3,800	7,800
	2.5% SOM	1,500	1,900	820	28,000	3,800	7,800
	6.0% SOM	1,700	1,900	1,600	28,000	3,800	7,900
EC >35-44	1.0% SOM	1,100	1,900	370	28,000	3,800	7,800
	2.5% SOM	1,500	1,900	820	28,000	3,800	7,800
	6.0% SOM	1,700	1,900	1,600	28,000	3,800	7,900
EC >44-70	1.0% SOM	1,600	1,900	1,200	28,000	3,800	7,800
	2.5% SOM	1,800	1,900	2,100	28,000	3,800	7,800
	6.0% SOM	1,900	1,900	3,000	28,000	3,800	7,900
SOM = Soil Organic Matter Content (%)							
^{vap} – GAC presented exceeds the vapour saturation limit, which is presented in brackets.							
^{sol} – GAC presented exceeds the soil saturation limit, which is presented in brackets.							

9.4. Polycyclic Aromatic Hydrocarbons (PAHs)

LQM/CIEH Suitable 4 Use Levels For Polycyclic Aromatic Hydrocarbons (PAHs)							
Determinands		RwHP (mg/kg)	RwoHP (mg/kg)	Allotment (mg/kg)	Commercial (mg/kg)	POSresi (mg/kg)	POSpark (mg/kg)
Acenaphthene	1.0% SOM	210	3,000 (57.0) ^{sol}	34	84,000(57.0) ^{sol}	15,000	29,000
	2.5% SOM	510	4,700(141) ^{sol}	85	97,000(141) ^{sol}	15,000	30,000
	6.0% SOM	1100	6,000(336) ^{sol}	200	100,000	15,000	30,000
Acenaphthylene	1.0% SOM	170	2,900(86.1) ^{sol}	28	83,000(86.1) ^{sol}	15,000	29,000
	2.5% SOM	420	4,600(212) ^{sol}	69	97,000(212) ^{sol}	15,000	30,000
	6.0% SOM	920	6,000(506) ^{sol}	160	100,000	15,000	30,000
Anthracene	1.0% SOM	2,400	31,000(1.17) ^{vap}	380	520,000	74,000	150,000
	2.5% SOM	5,400	35,000	950	540,000	74,000	150,000
	6.0% SOM	11,000	37,000	2,200	540,000	74,000	150,000
Benzo(a)anthracene	1.0% SOM	7.20	11	2.90	170	29	49
	2.5% SOM	11	14	6.50	170	29	56
	6.0% SOM	13	15	13	180	29	62
Benzo(a)pyrene	1.0% SOM	2.20	3.20	0.97	35	5.70	11
	2.5% SOM	2.70	3.20	2.00	35	5.70	12
	6.0% SOM	3.00	3.20	3.50	36	5.70	13
Benzo(b)fluoranthene	1.0% SOM	2.60	3.90	0.99	44	7.10	13
	2.5% SOM	3.30	4.00	2.10	44	7.20	15
	6.0% SOM	3.70	4.00	3.90	45	7.20	16
Benzo(ghi)perylene	1.0% SOM	320	360	290	3,900	640	1,400
	2.5% SOM	340	360	470	4,000	640	1,500
	6.0% SOM	350	360	640	4,000	640	1,600
Benzo(k)fluoranthene	1.0% SOM	77	110	37	1,200	190	370
	2.5% SOM	93	110	75	1,200	190	410
	6.0% SOM	100	110	130	1,200	190	440
Chrysene	1.0% SOM	15	30	4.10	350	57	93
	2.5% SOM	22	31	9.40	350	57	110
	6.0% SOM	27	32	19	350	57	120
Dibenzo(ah)anthracene	1.0% SOM	0.24	0.31	0.14	3.50	0.57	1.10
	2.5% SOM	0.28	0.32	0.27	3.50	0.57	1.30
	6.0% SOM	0.30	0.32	0.43	3.60	0.58	1.40
Fluoranthene	1.0% SOM	280	1,500	52	23,000	3,100	6,300
	2.5% SOM	560	1,600	130	23,000	3,100	6,300
	6.0% SOM	890	1,600	290	23,000	3,100	6,300
Flourene	1.0% SOM	170	2,800 (30.9) ^{sol}	27	63,000(30.9) ^{sol}	9,900	20,000
	2.5% SOM	400	3,800(76.5) ^{sol}	67	68,000	9,900	20,000
	6.0% SOM	860	4,500(183) ^{sol}	160	71,000	9,900	20,000
Indeno(123-cd)pyrene	1.0% SOM	27	45	9.50	500	82	150
	2.5% SOM	36	46	21	510	82	170
	6.0% SOM	41	46	39	510	82	180
Naphthalene	1.0% SOM	2.30	2.6	4.10	190 (76.4) ^{sol}	4,900	1,200(76.4) ^{sol}
	2.5% SOM	5.60	5.6	10	460 (183) ^{sol}	4,900	1,900(183) ^{sol}
	6.0% SOM	13	13	24	1,100 (432) ^{sol}	4,900	3,000
Phenanthrene	1.0% SOM	95	1,300(183) ^{sol}	15	22,000	3,100	6,200
	2.5% SOM	220	1,500	38	22,000	3,100	6,200
	6.0% SOM	440	1,500	90	23,000	3,100	6,300
Pyrene	1.0% SOM	620	3,700	110	54,000	7,400	15,000
	2.5% SOM	1200	3,800	270	54,000	7,400	15,000
	6.0% SOM	2000	3,800	620	54,000	7,400	15,000
Coal Tar (Benzo(a)pyrene used as marker compound)	1.0% SOM	0.79	1.2	0.32	15	2.20	4.40
	2.5% SOM	0.98	1.2	0.67	15	2.20	4.70
	6.0% SOM	1.10	1.2	1.20	15	2.20	4.80
SOM = Soil Organic Matter Content (%)							
^{vap} – GAC presented exceeds the vapour saturation limit, which is presented in brackets.							
^{sol} – GAC presented exceeds the soil saturation limit, which is presented in brackets.							

9.5. Volatile and Semi-volatile Organic Compounds

LQM CIEH General Assessment Criteria: Volatile and Semi-Volatile Organic Compounds							
Determinands		RwHP (mg/kg)	RwoHP (mg/kg)	Allotment (mg/kg)	Commercial (mg/kg)	POSresi (mg/kg)	POSpark (mg/kg)
<i>Chloroalkanes & alkenes</i>							
1,2 Dichloroethane	1.0% SOM	0.0071	0.0092	0.0046	0.67	29	21
	2.5% SOM	0.011	0.013	0.0083	0.97	29	24
	6.0% SOM	0.019	0.023	0.016	1.70	29	28
1,1,2,2 Tetrachloroethane	1.0% SOM	1.60	3.90	0.41	270	1,400	1,800
	2.5% SOM	3.40	8.00	0.89	550	1,400	2,100
	6.0% SOM	7.50	17	2.00	1,100	1,400	2,300
1,1,1,2 Tetrachloroethane	1.0% SOM	1.20	1.50	0.79	110	1,400	1,500
	2.5% SOM	2.80	3.50	1.90	250	1,400	1,800
	6.0% SOM	6.40	8.20	4.40	560	1,400	2,100
Tetrachloroethene	1.0% SOM	0.18	0.18	0.65	19	1,400	810 ^{sol} (424)
	2.5% SOM	0.39	0.40	1.50	42	1,400	1,100 ^{sol} (951)
	6.0% SOM	0.90	0.92	3.60	95	1,400	1,500
1,1,1 Trichloroethane	1.0% SOM	8.80	9.00	48	660	140,000	57,000 ^{vap} (1425)
	2.5% SOM	18	18	110	1,300	140,000	76,000 ^{vap} (2915)
	6.0% SOM	39	40	240	3,000	140,000	100,000 ^{vap} (6392)
Tetrachloromethene	1.0% SOM	0.026	0.026	0.45	2.90	890	190
	2.5% SOM	0.056	0.056	1.00	6.30	920	270
	6.0% SOM	0.130	0.130	2.40	14	950	400
Trichloroethene	1.0% SOM	0.016	0.017	0.041	1.20	120	70
	2.5% SOM	0.034	0.036	0.091	2.60	120	91
	6.0% SOM	0.075	0.080	0.210	5.70	120	120
Trichloromethane	1.0% SOM	0.91	1.20	0.42	99	2,500	2,600
	2.5% SOM	1.70	2.10	0.83	170	2,500	2,800
	6.0% SOM	3.40	4.20	1.70	350	2,500	3,100
Vinyl Chloride	1.0% SOM	0.00064	0.00077	0.00055	0.059	3.50	4.80
	2.5% SOM	0.00087	0.00100	0.00100	0.077	3.50	5.00
	6.0% SOM	0.00014	0.00150	0.00180	0.120	3.50	5.40
<i>Explosives</i>							
2,4,6 Trinitrotoluene	1.0% SOM	1.60	65	0.24	1,000	130	260
	2.5% SOM	3.70	66	0.58	1,000	130	270
	6.0% SOM	8.10	66	1.40	1,000	130	270
RDX (Hexogen/Cyclonite/1,3,5-trinitro-1,3,5-triazacyclohexane)	1.0% SOM	120	13,000	17	210,000	26,000	49,000(18.7) ^{sol}
	2.5% SOM	250	13,000	38	210,000	26,000	51,000
	6.0% SOM	540	13,000	85	210,000	27,000	53,000
HMX (Octogen/1,3,5,7-tetrenitro-1,3,5,7-tetrazacyclo-octane)	1.0% SOM	5.70	67,00	0.86	110,000	13,000	23,000(0.35) ^{vap}
	2.5% SOM	13	67,00	1.90	110,000	13,000	23,000(0.39) ^{vap}
	6.0% SOM	26	67,00	3.90	110,000	13,000	24,000(0.48) ^{vap}
Atrazine	1.0% SOM	3.30	610	0.50	9,300	1,200	2,300
	2.5% SOM	7.60	620	1.20	9,400	1,200	2,400
	6.0% SOM	17.40	620	2.70	9,400	1,200	2,400

^{vap} – GAC presented exceeds the vapour saturation limit, which is presented in brackets.
^{sol} – GAC presented exceeds the soil saturation limit, which is presented in brackets.

VOC and SVOC table continued overleaf

VOC and SVOC table continued from previous page

LQM CIEH General Assessment Criteria: Volatile and Semi-Volatile Organic Compounds							
Determinands		RwHP (mg/kg)	RwoHP (mg/kg)	Allotment (mg/kg)	Commercial (mg/kg)	POSresi (mg/kg)	POSpark (mg/kg)
Pesticides							
Aldrin	1.0% SOM	5.70	7.30	3.20	170	18	30
	2.5% SOM	6.60	7.40	6.10	170	18	31
	6.0% SOM	7.10	7.50	9.60	170	18	31
Dieldrin	1.0% SOM	0.97	7.00	0.17	170	18	30
	2.5% SOM	2.00	7.30	0.41	170	18	30
	6.0% SOM	3.50	7.40	0.96	170	18	31
Dichlorvos	1.0% SOM	0.032	6.40	0.0049	140	16	26
	2.5% SOM	0.066	6.50	0.0100	140	16	26
	6.0% SOM	0.140	6.60	0.0220	140	16	27
Alpha - Endosulfan	1.0% SOM	7.40	160(0.003) ^{vap}	1.20	5,600(0.003) ^{vap}	1,200	2,400
	2.5% SOM	18	280(0.007) ^{vap}	2.90	7,400(0.007) ^{vap}	1,200	2,400
	6.0% SOM	41	410(0.016) ^{vap}	6.80	8,400(0.016) ^{vap}	1,200	2,400
Beta - Endosulfan	1.0% SOM	7.00	190(0.00007) ^{vap}	1.10	6,300(0.00007) ^{vap}	1,200	2,400
	2.5% SOM	17	320(0.0002) ^{vap}	2.70	7,800(0.0002) ^{vap}	1,200	2,400
	6.0% SOM	39	440(0.0004) ^{vap}	6.40	8700	1,200	2,500
Alpha - Hexachlorocyclohexanes	1.0% SOM	0.23	6.90	0.035	170	24	47
	2.5% SOM	0.55	9.20	0.087	180	24	48
	6.0% SOM	1.20	11	0.210	180	24	48
Beta - Hexachlorocyclohexanes	1.0% SOM	0.085	3.70	0.013	65	8.10	15
	2.5% SOM	0.200	3.80	0.032	65	8.10	15
	6.0% SOM	0.460	3.80	0.077	65	8.10	16
Gamma - Hexachlorocyclohexanes	1.0% SOM	0.06	2.90	0.0092	67	8.2	14
	2.5% SOM	0.14	3.30	0.0230	69	8.2	15
	6.0% SOM	0.33	3.50	0.0540	70	8.2	15
Chlorobenzenes							
Chlorobenzene	1.0% SOM	0.46	0.46	5.90	56	11,000	1,300(675) ^{sol}
	2.5% SOM	1.00	1.00	14	130	13,000	2,000(1520) ^{sol}
	6.0% SOM	2.40	2.40	32	290	14,000	2,900
1,2-Dichlorobenzene	1.0% SOM	23	24	94	2,000 (571) ^{sol}	90,000	24,000(571) ^{sol}
	2.5% SOM	55	57	230	4,800 (1370) ^{sol}	95,000	36,000(1370) ^{sol}
	6.0% SOM	130	130	540	11,000 (3240) ^{sol}	98,000	51,000(3240) ^{sol}
1,3-Dichlorobenzene	1.0% SOM	0.40	0.44	0.25	30	300	390
	2.5% SOM	1.00	1.10	0.60	73	300	440
	6.0% SOM	2.30	2.50	1.50	170	300	470
1,4-Dichlorobenzene	1.0% SOM	61	61	15	4,400 (224) ^{vap}	17,000 ^g	36,000 (224) ^{vap}
	2.5% SOM	150	150	37	10,000 (540) ^{vap}	17,000 ^g	36,000 (540) ^{vap}
	6.0% SOM	350	350	88 ^g	25,000 (1280) ^{vap}	17,000 ^g	36,000 (1280) ^{vap}
1,2,3,-Trichlorobenzene	1.0% SOM	1.50	1.50	4.70	102	1,800	770(134) ^{vap}
	2.5% SOM	3.60	3.70	12	250	1,800	1,100(330) ^{vap}
	6.0% SOM	8.60	8.80	28	590	1,800	1,600(789) ^{vap}
1,2,4,-Trichlorobenzene	1.0% SOM	2.60	2.60	55	220	15,000	1,700(318) ^{vap}
	2.5% SOM	6.40	6.40	140	530	17,000	2,600(786) ^{vap}
	6.0% SOM	15	15	320	1,300	19,000	4,000(1880) ^{vap}
1,3,5,-Trichlorobenzene	1.0% SOM	0.33	0.33	4.70	23	1,700	380(36.7) ^{vap}
	2.5% SOM	0.81	0.81	12	55	1,700	590(90.8) ^{vap}
	6.0% SOM	1.90	1.90	140	130	1,800	860(217) ^{vap}
^{vap} – GAC presented exceeds the vapour saturation limit, which is presented in brackets.							
^{sol} – GAC presented exceeds the soil saturation limit, which is presented in brackets.							

VOC and SVOC table continued overleaf

VOC and SVOC table continued from previous page

LQM CIEH General Assessment Criteria: Volatile and Semi-Volatile Organic Compounds							
Determinands		RwHP (mg/kg)	RwoHP (mg/kg)	Allotment (mg/kg)	Commercial (mg/kg)	POSresi (mg/kg)	POSpark (mg/kg)
Chlorobenzenes (cont.)							
1,2,3,4,- Tetrachlorobenzene	1.0% SOM	15	24	4.40	1,700(122) ^{vap}	830	1,500(122) ^{vap}
	2.5% SOM	36	56	11	3,080(304) ^{vap}	830	1,600
	6.0% SOM	78	120	26	4,400(728) ^{vap}	830	1,600
1,2,3,5,- Tetrachlorobenzene	1.0% SOM	0.66	0.75	0.38	49(39.4) ^{vap}	78	110(39) ^{vap}
	2.5% SOM	1.60	1.90	0.90	120(98.1) ^{vap}	79	120
	6.0% SOM	3.70	4.30	2.20	240(235) ^{vap}	79	130
1,2,4, 5,- Tetrachlorobenzene	1.0% SOM	0.33	0.73	0.06	42(19.7) ^{sol}	13	25
	2.5% SOM	0.77	1.70	0.16	72(49.1) ^{sol}	13	26
	6.0% SOM	1.60	3.50	0.37	96	13	26
Pentachlorobenzene	1.0% SOM	5.80	19	1.20	640(43.0) ^{sol}	100	190
	2.5% SOM	12	30	3.10	770(107) ^{sol}	100	190
	6.0% SOM	22	38	7.00	830	100	190
Hexachlorobenzene	1.0% SOM	1.80(0.20) ^{vap}	4.10 (0.20) ^{vap}	0.47	110(0.20) ^{vap}	16	30
	2.5% SOM	3.30(0.50) ^{vap}	5.70 (0.50) ^{vap}	1.10	120	16	30
	6.0% SOM	4.90	6.70 (1.2) ^{vap}	2.50	120	16	30
Phenols & Chlorophenols							
BTEX	1.0% SOM	280	750	66	760 ^{dir} (31,000)	760 ^{dir} (11,000)	760 ^{dir} (8,600)
	2.5% SOM	550	1,300	140	1,500 ^{dir} (35,000)	1,500 ^{dir} (11,000)	1,500 ^{dir} (9,700)
	6.0% SOM	1100	2,300	280	3,200 ^{dir} (37,000)	3,200 ^{dir} (11,000)	3,200 ^{dir} (11,000)
Chlorophenols (4 Congeners)	1.0% SOM	0.87	94	0.13	3,500	620	1,100
	2.5% SOM	2.00	150	0.30	4,000	620	1,100
	6.0% SOM	4.50	210	0.70	4,300	620	1,100
Pentachlorophenols	1.0% SOM	0.22	27(16.4) ^{vap}	0.03	400	60	110
	2.5% SOM	0.52	29	0.08	400	60	120
	6.0% SOM	1.20	31	0.19	400	60	120
Others							
Carbon Disulphide	1.0% SOM	0.14	0.14	4.80	11	11,000	1,300
	2.5% SOM	0.29	0.29	10	22	11,000	1,900
	6.0% SOM	0.62	0.62	23	47	12,000	2,700
Hexachloro-1,3- Butadiene	1.0% SOM	0.29	0.32	0.25	31	25	48
	2.5% SOM	0.70	0.78	0.61	68	25	50
	6.0% SOM	1.60	1.80	1.40	120	25	51
^{vap} – GAC presented exceeds the vapour saturation limit, which is presented in brackets. ^{sol} – GAC presented exceeds the soil saturation limit, which is presented in brackets.							

VOC and SVOC table continued overleaf

VOC and SVOC table continued from previous page

CL:AIRE General Assessment Criteria: Volatile and Semi-Volatile Organic Compounds					
Determinands		RwHP (mg/kg)	RwoHP (mg/kg)	Allotment (mg/kg)	Commercial (mg/kg)
1,1,2 Trichloroethane	1.0% SOM	0.60	0.88	0.28	94
	2.5% SOM	1.20	1.8	0.61	190
	6.0% SOM	2.70	3.9	1.40	400
1,1-Dichloroethane	1.0% SOM	2.40	2.50	9.20	280
	2.5% SOM	3.90	4.10	17	450
	6.0% SOM	7.40	7.70	35	850
1,1-Dichloroethene	1.0% SOM	0.23	0.23	2.80	26
	2.5% SOM	0.40	0.41	5.60	46
	6.0% SOM	0.82	0.82	12	92
1,2,4-Trimethylbenzene	1.0% SOM	0.35	0.41	0.38	42
	2.5% SOM	0.85	0.99	0.93	99
	6.0% SOM	2.00	2.30	2.20	220
1,2-Dichloropropane	1.0% SOM	0.024	0.024	0.62	3.3
	2.5% SOM	0.042	0.042	1.20	5.9
	6.0% SOM	0.084	0.085	2.60	12
2,4-Dimethylphenol	1.0% SOM	19	210	3.10	16000*
	2.5% SOM	43	410	7.20	24000*
	6.0% SOM	97	730	17	30000*
2,4-Dinitrotoluene	1.0% SOM	1.50	170*	0.22	3700*
	2.5% SOM	3.20	170	0.49	3700*
	6.0% SOM	7.20	170	1.10	3800*
2,6-Dinitrotoluene	1.0% SOM	0.78	78	0.12	1900*
	2.5% SOM	1.70	84	0.27	1900*
	6.0% SOM	3.90	87	0.61	1900*
2-Chloronaphthalene	1.0% SOM	3.70	3.80	40	390*
	2.5% SOM	9.20	9.30	98	960*
	6.0% SOM	22	22	230	2200*
Biphenyl	1.0% SOM	66*	220*	14	18000*
	2.5% SOM	160	500*	35	33000*
	6.0% SOM	360	980*	83	48000*
Bis (2-ethylhexyl) phthalate	1.0% SOM	280*	2700*	47*	85000*
	2.5% SOM	610*	2800*	120*	86000*
	6.0% SOM	1100*	2800*	280*	86000*
Bromobenzene	1.0% SOM	0.87	0.91	3.2	97
	2.5% SOM	2.0	2.1	7.6	220
	6.0% SOM	4.7	4.9	18	520
Bromodichloromethane	1.0% SOM	0.016	0.019	0.016	2.1
	2.5% SOM	0.030	0.034	0.032	3.7
	6.0% SOM	0.061	0.070	0.068	7.6
Bromoform	1.0% SOM	2.8	5.2	0.95	760
	2.5% SOM	5.9	11	2.1	1500
	6.0% SOM	13	23	4.6	3100
Butyl benzyl phthalate	1.0% SOM	1400*	42000*	220*	940000*
	2.5% SOM	3300*	44000*	550*	940000*
	6.0% SOM	7200*	44000*	1300*	950000*

*soil concentration above saturation limit

VOC and SVOC table continued overleaf

VOC and SVOC table continued from previous page

CL:AIRE General Assessment Criteria: Volatile and Semi-Volatile Organic Compounds					
Determinands		RwHP (mg/kg)	RwoHP (mg/kg)	Allotment (mg/kg)	Commercial (mg/kg)
Chloroethane	1.0% SOM	8.3	8.4	110	960
	2.5% SOM	11	11	200	1300
	6.0% SOM	18	18	380	2100
Chloromethane	1.0% SOM	0.0083	0.0085	0.066	1.0
	2.5% SOM	0.0098	0.0099	0.13	1.2
	6.0% SOM	0.013	0.013	0.23	1.6
<i>Cis</i> 1,2 Dichloroethene	1.0% SOM	0.11	0.12	0.26	14
	2.5% SOM	0.19	0.20	0.50	24
	6.0% SOM	0.37	0.39	1.0	47
Dichloromethane	1.0% SOM	0.58	2.10	0.10	270
	2.5% SOM	0.98	2.80	0.19	360
	6.0% SOM	1.70	4.50	0.34	560
Diethyl Phthalate	1.0% SOM	120*	1800*	19*	150000*
	2.5% SOM	260*	3500*	41*	220000*
	6.0% SOM	570*	6300*	94*	290000*
Di- <i>n</i> -butyl phthalate	1.0% SOM	13*	450*	2.00	15000*
	2.5% SOM	31*	450*	5.00	15000*
	6.0% SOM	67*	450*	12	15000*
Di- <i>n</i> -octyl phthalate	1.0% SOM	2300*	3400*	940*	89000*
	2.5% SOM	2800*	3400*	2100*	89000*
	6.0% SOM	3100*	3400*	3900*	89000*
Hexachloroethane	1.0% SOM	0.20	0.22	0.27	22*
	2.5% SOM	0.48	0.54	0.67	53*
	6.0% SOM	1.10	1.30	1.60	120*
Isopropylbenzene	1.0% SOM	11	12	32	1400*
	2.5% SOM	27	28	79	3300*
	6.0% SOM	64	67	190	7700*
Methyl <i>tert</i> -butyl ether (MTBE)	1.0% SOM	49	73	23	7900
	2.5% SOM	84	120	44	13000
	6.0% SOM	160	220	90	24000
Propylbenzene	1.0% SOM	34	40	34	4100*
	2.5% SOM	82	97	83	9700*
	6.0% SOM	190	230	200	21000*
Styrene	1.0% SOM	8.10	35	1.60	3300*
	2.5% SOM	19	78	3.70	6500*
	6.0% SOM	43	170	8.70	11000*
Total Cresols (2-, 3-, and 4-methylphenol)	1.0% SOM	80	3700	12	160000
	2.5% SOM	180	5400	27	180000*
	6.0% SOM	400	6900	63	180000*
<i>Trans</i> 1,2 Dichloroethene	1.0% SOM	0.19	0.19	0.93	22
	2.5% SOM	0.34	0.35	1.90	40
	6.0% SOM	0.70	0.71	0.24	81
Tributyl tin oxide	1.0% SOM	0.25	1.40	0.042	130*
	2.5% SOM	0.59	3.10	0.100	180*
	6.0% SOM	1.30	5.70	0.240	200*

*soil concentration above saturation limit

APPENDIX G: Waste Hazard Assessment

Waste Classification Report

HazWasteOnline™ classifies waste as either **hazardous** or **non-hazardous** based on its chemical composition, related legislation and the rules and data defined in the current UK or EU technical guidance (Appendix C) (note that HP 9 Infectious is not assessed). It is the responsibility of the classifier named below to:

- understand the origin of the waste
- select the correct List of Waste code(s)
- confirm that the list of determinands, results and sampling plan are fit for purpose
- select and justify the chosen metal species (Appendix B)
- correctly apply moisture correction and other available corrections
- add the meta data for their user-defined substances (Appendix A)
- check that the classification engine is suitable with respect to the national destination of the waste (Appendix C)



LJQVU-HKG40-P3Z2L

To aid the reviewer, the laboratory results, assumptions and justifications managed by the classifier are highlighted in pale yellow.

Job name

Downlands Park, Bolmore Farm Lane

Description/Comments

Waste Hazard Assessment

Project

GWPR4765

Site

Haywards Heath, West Sussex

Classified by

Name:

Robert Terrell

Date:

28 Jun 2022 15:59 GMT

Telephone:

0333 600 1221

Company:

Ground and Water

HazWasteOnline™ provides a two day, hazardous waste classification course that covers the use of the software and both basic and advanced waste classification techniques. Certification has to be renewed every 3 years.

HazWasteOnline™ Certification:

-

Course

Hazardous Waste Classification

Date

-

Job summary

#	Sample name	Depth [m]	Classification Result	Hazard properties	Page
1	TP2-120522--0.20		Non Hazardous		2
2	TP2-120522--1.00		Non Hazardous		5
3	TP3-120522--0.20		Non Hazardous		6
4	TP3-120522--2.00		Non Hazardous		8
5	TP4-120522--0.20		Non Hazardous		9
6	TP5-120522--0.20		Non Hazardous		11
7	TP6-120522--0.90		Non Hazardous		12
8	TP8-120522--0.20		Non Hazardous		15

Related documents

#	Name	Description
1	220518-98.hwol[2]	.hwol[2] file used to create the Job
2	Ground and Water V2 PA	waste stream template used to create this Job

Report

Created by: Robert Terrell

Created date: 28 Jun 2022 15:59 GMT

Appendices	Page
Appendix A: Classifier defined and non GB MCL determinands	17
Appendix B: Rationale for selection of metal species	18
Appendix C: Version	19

Classification of sample: TP2-120522--0.20

 **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:	LoW Code:
TP2-120522--0.20	Chapter:
Moisture content:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
8.5% (wet weight correction)	Entry:
	17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

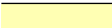
Determinands

Moisture content: 8.5% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number								
1	pH				7.57 pH		7.57	pH	7.57 pH		
2	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }				<1 mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<LOD
	006-007-00-5										
3	arsenic { arsenic trioxide }				7.16 mg/kg	1.32	8.65	mg/kg	0.000865 %	✓	
	033-003-00-0	215-481-4	1327-53-3								
4	boron { boron tribromide/trichloride/trifluoride (combined) }				1.12 mg/kg	13.43	13.763	mg/kg	0.00138 %	✓	
			10294-33-4, 10294-34-5, 7637-07-2								
5	cadmium { cadmium sulfide }			1	<0.02 mg/kg	1.285	<0.0257	mg/kg	<0.000002 %		<LOD
	048-010-00-4	215-147-8	1306-23-6								
6	copper { dicopper oxide; copper (I) oxide }				9.85 mg/kg	1.126	10.147	mg/kg	0.00101 %	✓	
	029-002-00-X	215-270-7	1317-39-1								
7	lead { lead chromate }			1	20.1 mg/kg	1.56	28.687	mg/kg	0.00184 %	✓	
	082-004-00-2	231-846-0	7758-97-6								
8	mercury { mercury dichloride }				<0.1 mg/kg	1.353	<0.135	mg/kg	<0.0000135 %		<LOD
	080-010-00-X	231-299-8	7487-94-7								
9	nickel { nickel dihydroxide }				7.17 mg/kg	1.579	10.362	mg/kg	0.00104 %	✓	
	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]								
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }				<1 mg/kg	1.405	<1.405	mg/kg	<0.000141 %		<LOD
	034-002-00-8										
11	vanadium { divanadium pentaoxide; vanadium pentoxide }				32.4 mg/kg	1.785	52.924	mg/kg	0.00529 %	✓	
	023-001-00-8	215-239-8	1314-62-1								
12	zinc { zinc chromate }				40.4 mg/kg	2.774	102.549	mg/kg	0.0103 %	✓	
	024-007-00-3	236-878-9	13530-65-9								
13	phenol				<0.01 mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
	604-001-00-2	203-632-7	108-95-2								
14	naphthalene				<0.009 mg/kg		<0.009	mg/kg	<0.0000009 %		<LOD
	601-052-00-2	202-049-5	91-20-3								

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
15	acenaphthylene	205-917-1	208-96-8		<0.012 mg/kg		<0.012 mg/kg	<0.0000012 %		<LOD
16	acenaphthene	201-469-6	83-32-9		<0.008 mg/kg		<0.008 mg/kg	<0.0000008 %		<LOD
17	fluorene	201-695-5	86-73-7		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
18	phenanthrene	201-581-5	85-01-8		<0.015 mg/kg		<0.015 mg/kg	<0.0000015 %		<LOD
19	anthracene	204-371-1	120-12-7		<0.016 mg/kg		<0.016 mg/kg	<0.0000016 %		<LOD
20	fluoranthene	205-912-4	206-44-0		<0.017 mg/kg		<0.017 mg/kg	<0.0000017 %		<LOD
21	pyrene	204-927-3	129-00-0		<0.015 mg/kg		<0.015 mg/kg	<0.0000015 %		<LOD
22	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3	<0.014 mg/kg		<0.014 mg/kg	<0.0000014 %		<LOD
23	chrysene	601-048-00-0	205-923-4	218-01-9	<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
24	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2	<0.015 mg/kg		<0.015 mg/kg	<0.0000015 %		<LOD
25	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9	<0.014 mg/kg		<0.014 mg/kg	<0.0000014 %		<LOD
26	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8	<0.015 mg/kg		<0.015 mg/kg	<0.0000015 %		<LOD
27	indeno[123-cd]pyrene	205-893-2	193-39-5		<0.018 mg/kg		<0.018 mg/kg	<0.0000018 %		<LOD
28	dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3	<0.023 mg/kg		<0.023 mg/kg	<0.0000023 %		<LOD
29	benzo[ghi]perylene	205-883-8	191-24-2		<0.024 mg/kg		<0.024 mg/kg	<0.0000024 %		<LOD
30	benzene	601-020-00-8	200-753-7	71-43-2	<0.009 mg/kg		<0.009 mg/kg	<0.0000009 %		<LOD
31	toluene	601-021-00-3	203-625-9	108-88-3	<0.007 mg/kg		<0.007 mg/kg	<0.0000007 %		<LOD
32	ethylbenzene	601-023-00-4	202-849-4	100-41-4	<0.004 mg/kg		<0.004 mg/kg	<0.0000004 %		<LOD
33	o-xylene; [1] p-xylene; [2] m-xylene; [3] xylene [4]	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]	<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
34	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4	<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
35	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0	<0.6 mg/kg	1.923	<1.154 mg/kg	<0.000115 %		<LOD
36	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }	215-160-9	1308-38-9		5.44 mg/kg	1.462	7.275 mg/kg	0.000728 %	✓	
Total:								0.0229 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP2-120522--1.00

✔ **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:	LoW Code:
TP2-120522--1.00	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Moisture content:	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)
12% (wet weight correction)	

Hazard properties

None identified

Determinands

Moisture content: 12% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number								
1	● pH				7.57 pH		7.57	pH	7.57 pH		
			PH								
Total:									0%		

Key

User supplied data
● Determinand defined or amended by HazWasteOnline (see Appendix A)

Classification of sample: TP3-120522--0.20

 **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:	LoW Code:
TP3-120522--0.20	Chapter:
Moisture content:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
11% (wet weight correction)	Entry:
	17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 11% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number								
1	pH				8.43 pH		8.43	pH	8.43 pH		
2	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }				<1 mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<LOD
	006-007-00-5										
3	arsenic { arsenic trioxide }				17.6 mg/kg	1.32	20.682	mg/kg	0.00207 %	✓	
	033-003-00-0	215-481-4	1327-53-3								
4	boron { boron tribromide/trichloride/trifluoride (combined) }				<1 mg/kg	13.43	<13.43	mg/kg	<0.00134 %		<LOD
			10294-33-4, 10294-34-5, 7637-07-2								
5	cadmium { cadmium sulfide }			1	0.0329 mg/kg	1.285	0.0376	mg/kg	0.00000293 %	✓	
	048-010-00-4	215-147-8	1306-23-6								
6	copper { dicopper oxide; copper (I) oxide }				16.9 mg/kg	1.126	16.934	mg/kg	0.00169 %	✓	
	029-002-00-X	215-270-7	1317-39-1								
7	lead { lead chromate }			1	32.6 mg/kg	1.56	45.256	mg/kg	0.0029 %	✓	
	082-004-00-2	231-846-0	7758-97-6								
8	mercury { mercury dichloride }				<0.1 mg/kg	1.353	<0.135	mg/kg	<0.0000135 %		<LOD
	080-010-00-X	231-299-8	7487-94-7								
9	nickel { nickel dihydroxide }				11.8 mg/kg	1.579	16.588	mg/kg	0.00166 %	✓	
	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]								
10	selenium { selenium compounds with the exception of cadmium selenosulfide and those specified elsewhere in this Annex }				2.55 mg/kg	1.405	3.189	mg/kg	0.000319 %	✓	
	034-002-00-8										
11	vanadium { divanadium pentaoxide; vanadium pentoxide }				20.1 mg/kg	1.785	31.935	mg/kg	0.00319 %	✓	
	023-001-00-8	215-239-8	1314-62-1								
12	zinc { zinc chromate }				35.1 mg/kg	2.774	86.662	mg/kg	0.00867 %	✓	
	024-007-00-3	236-878-9	13530-65-9								
13	phenol				<0.01 mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
	604-001-00-2	203-632-7	108-95-2								
14	naphthalene				0.0143 mg/kg		0.0127	mg/kg	0.00000127 %	✓	
	601-052-00-2	202-049-5	91-20-3								

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
15	acenaphthylene	205-917-1	208-96-8		0.0664 mg/kg		0.0591 mg/kg	0.00000591 %	✓	
16	acenaphthene	201-469-6	83-32-9		<0.008 mg/kg		<0.008 mg/kg	<0.0000008 %		<LOD
17	fluorene	201-695-5	86-73-7		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
18	phenanthrene	201-581-5	85-01-8		0.0935 mg/kg		0.0832 mg/kg	0.00000832 %	✓	
19	anthracene	204-371-1	120-12-7		0.0321 mg/kg		0.0286 mg/kg	0.00000286 %	✓	
20	fluoranthene	205-912-4	206-44-0		0.646 mg/kg		0.575 mg/kg	0.0000575 %	✓	
21	pyrene	204-927-3	129-00-0		0.639 mg/kg		0.569 mg/kg	0.0000569 %	✓	
22	benzo[a]anthracene	601-033-00-9	200-280-6		0.572 mg/kg		0.509 mg/kg	0.0000509 %	✓	
23	chrysene	601-048-00-0	205-923-4		0.468 mg/kg		0.417 mg/kg	0.0000417 %	✓	
24	benzo[b]fluoranthene	601-034-00-4	205-911-9		0.915 mg/kg		0.814 mg/kg	0.0000814 %	✓	
25	benzo[k]fluoranthene	601-036-00-5	205-916-6		0.386 mg/kg		0.344 mg/kg	0.0000344 %	✓	
26	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5		0.84 mg/kg		0.748 mg/kg	0.0000748 %	✓	
27	indeno[123-cd]pyrene	205-893-2	193-39-5		0.71 mg/kg		0.632 mg/kg	0.0000632 %	✓	
28	dibenz[a,h]anthracene	601-041-00-2	200-181-8		0.135 mg/kg		0.12 mg/kg	0.000012 %	✓	
29	benzo[ghi]perylene	205-883-8	191-24-2		0.548 mg/kg		0.488 mg/kg	0.0000488 %	✓	
30	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8		<0.6 mg/kg	1.923	<1.154 mg/kg	<0.000115 %		<LOD
31	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }	215-160-9	1308-38-9		<1.5 mg/kg	1.462	<2.192 mg/kg	<0.000219 %		<LOD
Total:								0.0229 %		

Key

- User supplied data
- Determinand values ignored for classification, see column 'Conc. Not Used' for reason
- Determinand defined or amended by HazWasteOnline (see Appendix A)
- Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
- <LOD Below limit of detection
- ND Not detected
- CLP: Note 1 Only the metal concentration has been used for classification

Classification of sample: TP3-120522--2.00



Non Hazardous Waste

Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:	LoW Code:
TP3-120522--2.00	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Moisture content:	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)
12% (wet weight correction)	

Hazard properties

None identified

Determinands

Moisture content: 12% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number								
1	pH				7 pH		7	pH	7pH		
			PH								
Total:									0%		

Key

- User supplied data
- Determinand defined or amended by HazWasteOnline (see Appendix A)

Classification of sample: TP4-120522--0.20

✔ **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:	LoW Code:
TP4-120522--0.20	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Moisture content:	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)
11% (wet weight correction)	

Hazard properties

None identified

Determinands

Moisture content: 11% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
1	pH				7.09 pH		7.09 pH	7.09 pH		
2	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }				<1 mg/kg	1.884	<1.884 mg/kg	<0.000188 %		<LOD
	006-007-00-5									
3	arsenic { arsenic trioxide }				9.42 mg/kg	1.32	11.069 mg/kg	0.00111 %	✓	
	033-003-00-0	215-481-4	1327-53-3							
4	boron { boron tribromide/trichloride/trifluoride (combined) }				<1 mg/kg	13.43	<13.43 mg/kg	<0.00134 %		<LOD
			10294-33-4, 10294-34-5, 7637-07-2							
5	cadmium { cadmium sulfide }			1	0.14 mg/kg	1.285	0.16 mg/kg	0.0000125 %	✓	
	048-010-00-4	215-147-8	1306-23-6							
6	copper { dicopper oxide; copper (I) oxide }				28 mg/kg	1.126	28.057 mg/kg	0.00281 %	✓	
	029-002-00-X	215-270-7	1317-39-1							
7	lead { lead chromate }			1	102 mg/kg	1.56	141.6 mg/kg	0.00908 %	✓	
	082-004-00-2	231-846-0	7758-97-6							
8	mercury { mercury dichloride }				<0.1 mg/kg	1.353	<0.135 mg/kg	<0.0000135 %		<LOD
	080-010-00-X	231-299-8	7487-94-7							
9	nickel { nickel dihydroxide }				12 mg/kg	1.579	16.869 mg/kg	0.00169 %	✓	
	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]							
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }				1.12 mg/kg	1.405	1.401 mg/kg	0.00014 %	✓	
	034-002-00-8									
11	vanadium { divanadium pentaoxide; vanadium pentoxide }				25.6 mg/kg	1.785	40.674 mg/kg	0.00407 %	✓	
	023-001-00-8	215-239-8	1314-62-1							
12	zinc { zinc chromate }				108 mg/kg	2.774	266.651 mg/kg	0.0267 %	✓	
	024-007-00-3	236-878-9	13530-65-9							
13	phenol				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
	604-001-00-2	203-632-7	108-95-2							
14	naphthalene				0.0177 mg/kg		0.0158 mg/kg	0.00000158 %	✓	
	601-052-00-2	202-049-5	91-20-3							

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number								
15	acenaphthylene	205-917-1	208-96-8		0.0326 mg/kg		0.029 mg/kg	0.0000029 %	✓		
16	acenaphthene	201-469-6	83-32-9		<0.008 mg/kg		<0.008 mg/kg	<0.0000008 %			<LOD
17	fluorene	201-695-5	86-73-7		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %			<LOD
18	phenanthrene	201-581-5	85-01-8		0.119 mg/kg		0.106 mg/kg	0.0000106 %	✓		
19	anthracene	204-371-1	120-12-7		0.0347 mg/kg		0.0309 mg/kg	0.00000309 %	✓		
20	fluoranthene	205-912-4	206-44-0		0.529 mg/kg		0.471 mg/kg	0.0000471 %	✓		
21	pyrene	204-927-3	129-00-0		0.484 mg/kg		0.431 mg/kg	0.0000431 %	✓		
22	benzo[a]anthracene	601-033-00-9	200-280-6		0.337 mg/kg		0.3 mg/kg	0.00003 %	✓		
23	chrysene	601-048-00-0	205-923-4		0.351 mg/kg		0.312 mg/kg	0.0000312 %	✓		
24	benzo[b]fluoranthene	601-034-00-4	205-911-9		0.536 mg/kg		0.477 mg/kg	0.0000477 %	✓		
25	benzo[k]fluoranthene	601-036-00-5	205-916-6		0.218 mg/kg		0.194 mg/kg	0.0000194 %	✓		
26	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5		0.412 mg/kg		0.367 mg/kg	0.0000367 %	✓		
27	indeno[123-cd]pyrene	205-893-2	193-39-5		0.323 mg/kg		0.287 mg/kg	0.0000287 %	✓		
28	dibenz[a,h]anthracene	601-041-00-2	200-181-8		0.0588 mg/kg		0.0523 mg/kg	0.00000523 %	✓		
29	benzo[ghi]perylene	205-883-8	191-24-2		0.264 mg/kg		0.235 mg/kg	0.0000235 %	✓		
30	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8		<0.6 mg/kg	1.923	<1.154 mg/kg	<0.000115 %			<LOD
31	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }	215-160-9	1308-38-9		8.26 mg/kg	1.462	10.744 mg/kg	0.00107 %	✓		
Total:									0.0486 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
•	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP5-120522--0.20

✔ **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:	LoW Code:
TP5-120522--0.20	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Moisture content:	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)
8.7% (wet weight correction)	

Hazard properties

None identified

Determinands

Moisture content: 8.7% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
1	benzene				<0.18 mg/kg		<0.18 mg/kg	<0.000018 %		<LOD
	601-020-00-8	200-753-7	71-43-2							
2	toluene				<0.14 mg/kg		<0.14 mg/kg	<0.000014 %		<LOD
	601-021-00-3	203-625-9	108-88-3							
3	ethylbenzene				<0.08 mg/kg		<0.08 mg/kg	<0.000008 %		<LOD
	601-023-00-4	202-849-4	100-41-4							
4	o-xylene; [1] p-xylene; [2] m-xylene; [3] xylene [4]				<0.4 mg/kg		<0.4 mg/kg	<0.00004 %		<LOD
	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]							
5	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.2 mg/kg		<0.2 mg/kg	<0.00002 %		<LOD
	603-181-00-X	216-653-1	1634-04-4							
6	coronene				<0.2 mg/kg		<0.2 mg/kg	<0.00002 %		<LOD
		205-881-7	191-07-1							
7	polychlorobiphenyls; PCB				<0.021 mg/kg		<0.021 mg/kg	<0.0000021 %		<LOD
	602-039-00-4	215-648-1	1336-36-3							
Total:								0.00012 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
<LOD	Below limit of detection
ND	Not detected

Classification of sample: TP6-120522--0.90

 **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:	LoW Code:
TP6-120522--0.90	Chapter:
Moisture content:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
16% (wet weight correction)	Entry:
	17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

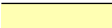
Determinands

Moisture content: 16% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number								
1	pH				8.14 pH		8.14	pH	8.14 pH		
2	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }				<1 mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<LOD
	006-007-00-5										
3	arsenic { arsenic trioxide }				7.12 mg/kg	1.32	7.897	mg/kg	0.00079 %	✓	
	033-003-00-0	215-481-4	1327-53-3								
4	boron { boron tribromide/trichloride/trifluoride (combined) }				<1 mg/kg	13.43	<13.43	mg/kg	<0.00134 %		<LOD
			10294-33-4, 10294-34-5, 7637-07-2								
5	cadmium { cadmium sulfide }			1	0.274 mg/kg	1.285	0.296	mg/kg	0.000023 %	✓	
	048-010-00-4	215-147-8	1306-23-6								
6	copper { dicopper oxide; copper (I) oxide }				14.3 mg/kg	1.126	13.524	mg/kg	0.00135 %	✓	
	029-002-00-X	215-270-7	1317-39-1								
7	lead { lead chromate }			1	35.8 mg/kg	1.56	46.907	mg/kg	0.00301 %	✓	
	082-004-00-2	231-846-0	7758-97-6								
8	mercury { mercury dichloride }				<0.1 mg/kg	1.353	<0.135	mg/kg	<0.0000135 %		<LOD
	080-010-00-X	231-299-8	7487-94-7								
9	nickel { nickel dihydroxide }				10.8 mg/kg	1.579	14.329	mg/kg	0.00143 %	✓	
	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]								
10	selenium { selenium compounds with the exception of cadmium selenosulfide and those specified elsewhere in this Annex }				<1 mg/kg	1.405	<1.405	mg/kg	<0.000141 %		<LOD
	034-002-00-8										
11	vanadium { divanadium pentaoxide; vanadium pentoxide }				27.2 mg/kg	1.785	40.788	mg/kg	0.00408 %	✓	
	023-001-00-8	215-239-8	1314-62-1								
12	zinc { zinc chromate }				41.8 mg/kg	2.774	97.406	mg/kg	0.00974 %	✓	
	024-007-00-3	236-878-9	13530-65-9								
13	phenol				<0.01 mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
	604-001-00-2	203-632-7	108-95-2								
14	naphthalene				<0.009 mg/kg		<0.009	mg/kg	<0.0000009 %		<LOD
	601-052-00-2	202-049-5	91-20-3								

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
15	acenaphthylene	205-917-1	208-96-8		<0.012 mg/kg		<0.012 mg/kg	<0.0000012 %		<LOD
16	acenaphthene	201-469-6	83-32-9		<0.008 mg/kg		<0.008 mg/kg	<0.0000008 %		<LOD
17	fluorene	201-695-5	86-73-7		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
18	phenanthrene	201-581-5	85-01-8		<0.015 mg/kg		<0.015 mg/kg	<0.0000015 %		<LOD
19	anthracene	204-371-1	120-12-7		<0.016 mg/kg		<0.016 mg/kg	<0.0000016 %		<LOD
20	fluoranthene	205-912-4	206-44-0		0.0271 mg/kg		0.0228 mg/kg	0.00000228 %	✓	
21	pyrene	204-927-3	129-00-0		0.0246 mg/kg		0.0207 mg/kg	0.00000207 %	✓	
22	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3	0.0176 mg/kg		0.0148 mg/kg	0.00000148 %	✓	
23	chrysene	601-048-00-0	205-923-4	218-01-9	0.0166 mg/kg		0.0139 mg/kg	0.00000139 %	✓	
24	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2	0.0259 mg/kg		0.0218 mg/kg	0.00000218 %	✓	
25	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9	<0.014 mg/kg		<0.014 mg/kg	<0.0000014 %		<LOD
26	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8	0.0181 mg/kg		0.0152 mg/kg	0.00000152 %	✓	
27	indeno[123-cd]pyrene	205-893-2	193-39-5		<0.018 mg/kg		<0.018 mg/kg	<0.0000018 %		<LOD
28	dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3	<0.023 mg/kg		<0.023 mg/kg	<0.0000023 %		<LOD
29	benzo[ghi]perylene	205-883-8	191-24-2		<0.024 mg/kg		<0.024 mg/kg	<0.0000024 %		<LOD
30	benzene	601-020-00-8	200-753-7	71-43-2	<0.009 mg/kg		<0.009 mg/kg	<0.0000009 %		<LOD
31	toluene	601-021-00-3	203-625-9	108-88-3	<0.007 mg/kg		<0.007 mg/kg	<0.0000007 %		<LOD
32	ethylbenzene	601-023-00-4	202-849-4	100-41-4	<0.004 mg/kg		<0.004 mg/kg	<0.0000004 %		<LOD
33	o-xylene; [1] p-xylene; [2] m-xylene; [3] xylene [4]	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]	<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
34	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4	<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
35	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0	<0.6 mg/kg	1.923	<1.154 mg/kg	<0.000115 %		<LOD
36	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }	215-160-9	1308-38-9		11.1 mg/kg	1.462	13.628 mg/kg	0.00136 %	✓	
Total:								0.0236 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP8-120522--0.20

✔ **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:	LoW Code:
TP8-120522--0.20	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Moisture content:	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)
14% (wet weight correction)	

Hazard properties

None identified

Determinands

Moisture content: 14% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
1	pH				6.39 pH		6.39 pH	6.39 pH		
2	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }				<1 mg/kg	1.884	<1.884 mg/kg	<0.000188 %		<LOD
	006-007-00-5									
3	arsenic { arsenic trioxide }				6.98 mg/kg	1.32	7.926 mg/kg	0.000793 %	✓	
	033-003-00-0	215-481-4	1327-53-3							
4	boron { boron tribromide/trichloride/trifluoride (combined) }				<1 mg/kg	13.43	<13.43 mg/kg	<0.00134 %		<LOD
			10294-33-4, 10294-34-5, 7637-07-2							
5	cadmium { cadmium sulfide }			1	<0.02 mg/kg	1.285	<0.0257 mg/kg	<0.000002 %		<LOD
	048-010-00-4	215-147-8	1306-23-6							
6	copper { dicopper oxide; copper (I) oxide }				9.08 mg/kg	1.126	8.792 mg/kg	0.000879 %	✓	
	029-002-00-X	215-270-7	1317-39-1							
7	lead { lead chromate }			1	30 mg/kg	1.56	40.243 mg/kg	0.00258 %	✓	
	082-004-00-2	231-846-0	7758-97-6							
8	mercury { mercury dichloride }				<0.1 mg/kg	1.353	<0.135 mg/kg	<0.0000135 %		<LOD
	080-010-00-X	231-299-8	7487-94-7							
9	nickel { nickel dihydroxide }				6.8 mg/kg	1.579	9.237 mg/kg	0.000924 %	✓	
	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]							
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }				<1 mg/kg	1.405	<1.405 mg/kg	<0.000141 %		<LOD
	034-002-00-8									
11	vanadium { divanadium pentaoxide; vanadium pentoxide }				22.9 mg/kg	1.785	35.157 mg/kg	0.00352 %	✓	
	023-001-00-8	215-239-8	1314-62-1							
12	zinc { zinc chromate }				33.2 mg/kg	2.774	79.207 mg/kg	0.00792 %	✓	
	024-007-00-3	236-878-9	13530-65-9							
13	phenol				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
	604-001-00-2	203-632-7	108-95-2							
14	naphthalene				<0.009 mg/kg		<0.009 mg/kg	<0.0000009 %		<LOD
	601-052-00-2	202-049-5	91-20-3							

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number								
15	acenaphthylene	205-917-1	208-96-8		<0.012 mg/kg		<0.012 mg/kg	<0.0000012 %			<LOD
16	acenaphthene	201-469-6	83-32-9		<0.008 mg/kg		<0.008 mg/kg	<0.0000008 %			<LOD
17	fluorene	201-695-5	86-73-7		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %			<LOD
18	phenanthrene	201-581-5	85-01-8		0.0292 mg/kg		0.0251 mg/kg	0.00000251 %		✓	
19	anthracene	204-371-1	120-12-7		<0.016 mg/kg		<0.016 mg/kg	<0.0000016 %			<LOD
20	fluoranthene	205-912-4	206-44-0		0.073 mg/kg		0.0628 mg/kg	0.00000628 %		✓	
21	pyrene	204-927-3	129-00-0		0.0672 mg/kg		0.0578 mg/kg	0.00000578 %		✓	
22	benzo[a]anthracene	601-033-00-9	200-280-6		0.0303 mg/kg		0.0261 mg/kg	0.00000261 %		✓	
23	chrysene	601-048-00-0	205-923-4		0.0302 mg/kg		0.026 mg/kg	0.0000026 %		✓	
24	benzo[b]fluoranthene	601-034-00-4	205-911-9		0.0345 mg/kg		0.0297 mg/kg	0.00000297 %		✓	
25	benzo[k]fluoranthene	601-036-00-5	205-916-6		<0.014 mg/kg		<0.014 mg/kg	<0.0000014 %			<LOD
26	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5		0.0438 mg/kg		0.0377 mg/kg	0.00000377 %		✓	
27	indeno[123-cd]pyrene	205-893-2	193-39-5		0.0397 mg/kg		0.0341 mg/kg	0.00000341 %		✓	
28	dibenz[a,h]anthracene	601-041-00-2	200-181-8		<0.023 mg/kg		<0.023 mg/kg	<0.0000023 %			<LOD
29	benzo[ghi]perylene	205-883-8	191-24-2		0.0322 mg/kg		0.0277 mg/kg	0.00000277 %		✓	
30	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8		<0.6 mg/kg	1.923	<1.154 mg/kg	<0.000115 %			<LOD
31	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }	215-160-9	1308-38-9		8.97 mg/kg	1.462	11.275 mg/kg	0.00113 %		✓	
Total:									0.0196 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
•	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Appendix A: Classifier defined and non GB MCL determinands

• pH (CAS Number: PH)

Description/Comments: Appendix C4
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: None.

• salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex

GB MCL index number: 006-007-00-5
Description/Comments: Conversion factor based on a worst case compound: sodium cyanide
Additional Hazard Statement(s): EUH032 >= 0.2 %
Reason for additional Hazards Statement(s):
20 Nov 2021 - EUH032 >= 0.2 % hazard statement sourced from: WM3, Table C12.2

• boron tribromide/trichloride/trifluoride (combined) (CAS Number: 10294-33-4, 10294-34-5, 7637-07-2)

Description/Comments: Combines the hazard statements and the average of the conversion factors for boron tribromide, boron trichloride and boron trifluoride
Data source: N/A
Data source date: 06 Aug 2015
Hazard Statements: EUH014 , Acute Tox. 2; H330 , Acute Tox. 2; H300 , Skin Corr. 1A; H314 , Skin Corr. 1B; H314

• acenaphthylene (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4; H302 , Acute Tox. 1; H330 , Acute Tox. 1; H310 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315

• acenaphthene (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Aquatic Chronic 2; H411

• fluorene (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 06 Aug 2015
Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

• phenanthrene (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 06 Aug 2015
Hazard Statements: Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Carc. 2; H351 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Skin Irrit. 2; H315

• anthracene (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

• fluoranthene (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 21 Aug 2015
Hazard Statements: Acute Tox. 4; H302 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

• pyrene (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 21 Aug 2015
Hazard Statements: Skin Irrit. 2; H315 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

■ **indeno[123-cd]pyrene** (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 06 Aug 2015
Hazard Statements: Carc. 2; H351

■ **benzo[ghi]perylene** (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 23 Jul 2015
Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

■ **ethylbenzene** (EC Number: 202-849-4, CAS Number: 100-41-4)

GB MCL index number: 601-023-00-4
Description/Comments:
Additional Hazard Statement(s): Carc. 2; H351
Reason for additional Hazards Statement(s):
20 Nov 2021 - Carc. 2; H351 hazard statement sourced from: IARC Group 2B (77) 2000

■ **chromium(III) oxide (worst case)** (EC Number: 215-160-9, CAS Number: 1308-38-9)

Description/Comments: Data from C&L Inventory Database
Data source: <https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/details/33806>
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4; H332 , Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Resp. Sens. 1; H334 , Skin Sens. 1; H317 , Repr. 1B; H360FD , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

■ **coronene** (EC Number: 205-881-7, CAS Number: 191-07-1)

Description/Comments: Data from C&L Inventory Database; no entries in Registered Substances or Pesticides Properties databases; SDS: Sigma Aldrich, 1907/2006 compliant, dated 2012 - no entries; IARC – Group 3, not carcinogenic.
Data source: <http://clp-inventory.echa.europa.eu/SummaryOfClassAndLabelling.aspx?SubstanceID=17010&HarmOnly=no?fc=true&lang=en>
Data source date: 16 Jun 2014
Hazard Statements: STOT SE 2; H371

■ **polychlorobiphenyls; PCB** (EC Number: 215-648-1, CAS Number: 1336-36-3)

GB MCL index number: 602-039-00-4
Description/Comments: Worst Case: IARC considers PCB Group 1; Carcinogenic to humans; POP specific threshold from ATP1 (Regulation 756/2010/EU) to POPs Regulation (Regulation 850/2004/EC). Where applicable, the calculation method laid down in European standards EN 12766-1 and EN 12766-2 shall be applied.
Additional Hazard Statement(s): Carc. 1A; H350
Reason for additional Hazards Statement(s):
20 Nov 2021 - Carc. 1A; H350 hazard statement sourced from: IARC Group 1 (23, Sup 7, 100C) 2012

Appendix B: Rationale for selection of metal species

cyanides {salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex}

Worst case species

arsenic {arsenic trioxide}

Worst case species based on risk phrases

boron {boron tribromide/trichloride/trifluoride (combined)}

Worst case species based on risk phrases

cadmium {cadmium sulfide}

Worst case species based on risk phrases

copper {dicopper oxide; copper (I) oxide}

Most likely common species

lead {lead chromate}

Worst case species based on risk phrases

mercury {mercury dichloride}

Worst case species based on risk phrases

nickel {nickel dihydroxide}

Worst case species based on risk phrases

selenium {selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex}

Worst case species based on risk phrases

vanadium {divanadium pentaoxide; vanadium pentoxide}

most common form

zinc {zinc chromate}

Worst case species based on risk phrases

chromium in chromium(VI) compounds {chromium(VI) oxide}

Most likely

chromium in chromium(III) compounds {chromium(III) oxide (worst case)}

worst case

Appendix C: Version

HazWasteOnline Classification Engine: **WM3 1st Edition v1.2.GB - Oct 2021**

HazWasteOnline Classification Engine Version: 2022.176.5209.9795 (25 Jun 2022)

HazWasteOnline Database: 2022.176.5209.9795 (25 Jun 2022)

This classification utilises the following guidance and legislation:

WM3 v1.2.GB - Waste Classification - 1st Edition v1.2.GB - Oct 2021

CLP Regulation - Regulation 1272/2008/EC of 16 December 2008

1st ATP - Regulation 790/2009/EC of 10 August 2009

2nd ATP - Regulation 286/2011/EC of 10 March 2011

3rd ATP - Regulation 618/2012/EU of 10 July 2012

4th ATP - Regulation 487/2013/EU of 8 May 2013

Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013

5th ATP - Regulation 944/2013/EU of 2 October 2013

6th ATP - Regulation 605/2014/EU of 5 June 2014

WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014

Revised List of Waste 2014 - Decision 2014/955/EU of 18 December 2014

7th ATP - Regulation 2015/1221/EU of 24 July 2015

8th ATP - Regulation (EU) 2016/918 of 19 May 2016

9th ATP - Regulation (EU) 2016/1179 of 19 July 2016

10th ATP - Regulation (EU) 2017/776 of 4 May 2017

HP14 amendment - Regulation (EU) 2017/997 of 8 June 2017

13th ATP - Regulation (EU) 2018/1480 of 4 October 2018

14th ATP - Regulation (EU) 2020/217 of 4 October 2019

15th ATP - Regulation (EU) 2020/1182 of 19 May 2020

The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use)(Amendment etc.) (EU Exit)

Regulations 2020 - UK: 2020 No. 1567 of 16th December 2020

The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020 - UK:

2020 No. 1540 of 16th December 2020

GB MCL List - version 1.1 of 09 June 2021

APPENDIX C

LMB GEOSOLUTIONS GI

REPORT

LMB Geosolutions Ltd



August 20, 2024

Ashwin Halaria
Associate Director
Unit 6 The Courtyard,
Lynton Road,
London N8 8SL

RE: Infiltration Soakaway Testing, Downlands Park, Haywards Heath RH16

Introduction & Background

LMB Geosolutions Ltd (LMB) was instructed by Symmetrys Ltd (Consultant Engineers) on behalf of Four Quarters Developments Ltd (the Client) to undertake soakaway tests to support the proposed development at Downlands Park, Bolnore Farm Lane, Haywards Heath, West Sussex RH16 4BQ (the Site).

The Consultant Engineers provided the following specification for the required works:

- Symmetrys (ref. 21279-SYM-XX-XX-SP-C-001, Rev C, dated 26/07/24). Infiltration Test Specification. Downlands Park, Bolnore Farm Lane, Haywards Heath, West Sussex RH16 4BQ.

It is understood that the Client wishes to demolish the existing care home facility and construct a care retirement community consisting of 85 extra care apartments, guest suites, staff facilities, pavilion, and parking spaces.

It is understood that planning permission for the development has been granted and that one of the planning conditions requires a detailed strategy for foul and surface water drainage.

The specification was amended by the Consultant Engineers to reduce the number of locations from nine to eight (ref drawing (ref. 21279-SYM-XX-XX-SK-C-0001-REV D, dated 27.07.24). The specification also included scope for infiltration testing on an existing borehole however the Consultant Engineers indicated that they would not proceed with this until an assessment of its condition has been completed.

Scope of Works

The following scope of works has been undertaken:

- Completion of a service avoidance level and positioning survey at exploratory hole locations.
- Excavation of 8no. test pit to depths of between 2.10m and 2.50m bgl with geological logging in general accordance with BS 5930;
- Completion of infiltration testing at the test pit locations in general accordance with BRE 365;
- Completion of a factual and interpretive letter report that includes;
 - A summary of the fieldworks completed and ground conditions encountered;
 - Geological logs for the test pits excavated.
 - Presentation of infiltration test results.
 - Conclusions and recommendations.

Fieldworks

Eight trial pits (SW1 to SW8 inclusive) were excavated using a mechanical excavator at locations specified by the Consultant Engineers. Prior to commencement all locations were surveyed to avoid below ground services and to record xyz co-ordinates.

A plan provided by the Consultant Engineers showing the approximate location of the trial pits used for infiltration testing is provided as **Figure 1**.

The trial pits were logged by an experienced geo-environmental engineer in general accordance with BS5930 (see **Appendix A**).

In accordance with the specification the trial pits were excavated to a depth of 2.50m below ground level (bgl) except in locations SW1 and SW7 which were terminated on rock at depths of 2.10m bgl.

Following excavation, the trial pits were surcharged with water from a towed bowser and the fall in depth of water with time recorded.

Two repeat tests were completed in all locations over the duration of the works, apart from SW7 where repeat testing was not possible over the timescales of the fieldworks.

Summary of Ground Conditions

The exploratory hole logs are provided in **Appendix A** with a summary provided in the table below:

Strata	Depth Range to Top (m bgl)	Depth Range to Base (m bgl)	Summary Description
Topsoil	Ground Level	0.15 – 0.20	Typically found to comprise dark brown clayey sand with occasional rootlets
Made Ground ⁽¹⁾	Ground Level	0.55	Comprises light to dark brownish grey slightly clayey gravelly Sand. Gravel brick and concrete
Upper Tunbridge Wells Sand ⁽²⁾	0.80	3.20	Typically found to comprise firm becoming stiff orangish brown mottled light grey locally sandy Clay. In locations SW1, SW6, SW7 and SW8 overlies strata typically recovered as Siltstone gravel and cobbles.

(1) Only encountered in location SW3

(2) Base not determined.

No groundwater was observed during the trial pit excavations.

Infiltration Test Results

Assessment Methodology

The infiltration test data was assessed in accordance with the methodology outlined in BRE Digest 365 (2016): Soakaway Design. This document describes '*design and construction procedures for soakaways explains how to calculate rainfall design values and soil infiltration rates and gives design examples.*'

The methodology applied in this assessment specifically relates to the calculation of soil infiltration rate within the unsaturated zone.

Variations

In the majority of locations, the water level did not drain over the effective depth (d25-d75) based on the excavated trial pit dimensions and initial fill level i.e. the tests did not meet the requirements of BRE365. As such the infiltration rate (and effective storage depth) has been derived based on the data acquired i.e. adjusted to the volume of water that drained over the duration of the test. This is not in accordance with BRE 365.

The exception is the first test completed in location SW8 where the soil infiltration rates have been estimated in general accordance with BRE365.

Assessment Results

The results of the infiltration tests completed have been used to derive the following soil infiltration rates:

Location	Test No.	Derived Soil Infiltration Rate (m/s)	Lithology of Test Section
SW1	1	1.74E-06 ⁽¹⁾	Upper Tunbridge Wells Sand
	2	8.04E-06 ⁽¹⁾	
SW2	1	3.01E-07 ⁽¹⁾	
	2	1.96E-06 ⁽¹⁾	
SW3	1	1.18E-06 ⁽¹⁾	
	2	3.62E-06 ⁽¹⁾	
SW4	1	1.50E-06 ⁽¹⁾	
	2	1.84E-05 ⁽¹⁾	
SW5	1	5.57E-07 ⁽¹⁾	
	2	1.24E-06 ⁽¹⁾	
SW6	1	1.63E-06 ⁽¹⁾	
	2	7.16E-06 ⁽¹⁾	
SW7	1	1.15E-05 ⁽¹⁾	
SW8	1	1.69E-05	
	2	3.49E05 ⁽¹⁾	

(1) Values adjusted and test results not in accordance with BRE365.

The soil infiltration worksheets, including raw data are provided in **Appendix B**.

Use of Results & Current Best Practice Guidance

As outlined, it is understood that the infiltration testing works have been completed to aid in the assessing options for the surface water drainage strategy for the proposed development and specifically the feasibility of using traditional soakaways.

The majority of the soakaway tests completed failed to drain over the effective depth (d25-d75) and as such do not conform with the BRE 365 guidance.

Infiltration rates have been derived (SW1-SW7 inclusive) using the available data but this is not in accordance with the BRE 365 approach and it is recommended that this data should not be applied for drainage design for traditional soakaways.

The infiltration testing at location SW8 (test 1) did conform with BRE 365 guidance but in accordance with current best practice guidance the **lowest** derived infiltration rate should be considered within the appraisal of infiltration drainage.

In addition, careful consideration should be given to the long term sustainability of a traditional soakaway based on the test results at location SW8 (test 1) as over the wider site the test results suggest that the use of traditional soakaways is unlikely to be feasible.

I trust the above and appended information is of use. However, if you require any further information then please feel free to contact me at your convenience.

Sincerely,

A handwritten signature in black ink, appearing to read 'P. Lewis'.

Philip Lewis
Hydrogeologist
LMB Geosolutions Ltd

T: 020 3198 6481 | M: +44 (0) 7739735097 | E: philip@lmbgeosolutions.com

Figure 1

Key



Existing 60m deep borehole to be tested (Falling Head Test) in 20m increments

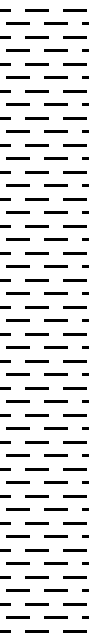


Proposed location of soakaway testing to BRE Digest 365 (Depth = 2.5m)



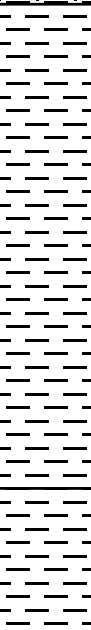
APPENDICES

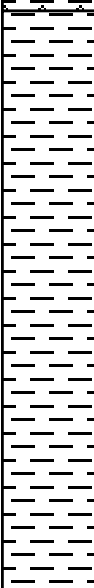
A Exploratory Hole Log & Photographs

LMB Ground Investigation Land Contamination Hydrogeology Engineering Geology		Trial Pit Log							SW2	
		Page 1 of 1								
		Project Name: Project No: N/A								
		Location: Co-ords: 532009.277 - 123748.501 Level: 92.025								
		Hole Type: TP Logged By: CH Dates: 12/08/2024 -								
Client: Consultant:										
Plant Used: Length: 2 Width: 0.7										
Well	Water	Samples		Result	Depth	Level	Legend	Stratum Description	Depth m	
		Depth (m)	Type							
					0.15	91.88		Dark brown clayey sand with occasional rootlets Topsoil		
					0.50	91.53			0.5	
									1.0	
									1.5	
					2.50	89.53		Orangish brown clayey SAND Sand is fine to coarse Upper Tunbridge Wells Sand	2.0	
								Firm to stiff orangish brown mottled light grey slightly sandy CLAY Becomes stiff at 1.6m bgl Upper Tunbridge Wells Sand	2.5	
									3.0	
									3.5	
									4.0	
									4.5	

LMB Ground Investigation Land Contamination Hydrogeology Engineering Geology		Trial Pit Log							SW3	
		Page 1 of 1								
		Project Name: Project No: N/A								
		Location: Co-ords: 532017.872 - 123714.722 Level: 91.6								
		Hole Type: TP Logged By: CH Dates: 12/08/2024 -								
Client: Consultant:										
Plant Used: Length: 2.1 Width: 0.7										
Well	Water	Samples		Result	Depth	Level	Legend	Stratum Description	Depth m	
		Depth (m)	Type							
					0.15	91.45		Dark brown clayey sand with occasional rootlets Topsoil		
					0.55	91.05		MADE GROUND light to dark brownish grey slightly clayey gravelly sand Gravel is fine to coarse angular to rounded brick and concrete Moderate brick cobble content	0.5	
					2.50	89.10			2.5	
								Firm to stiff orangish grey mottled orangish brown slightly sandy CLAY Becomes stiff at 1.6m bgl Upper Tunbridge Wells Sand	3.5	
									4.0	
									4.5	

LMB Ground Investigation Land Contamination Hydrogeology Engineering Geology		Trial Pit Log							SW4			
		Page 1 of 1										
		Project Name: Project No: N/A										
		Location: Co-ords: 532043.113 - 123745.123 Level: 93.496										
		Hole Type: TP Logged By: CH Dates: 12/08/2024 -										
Client: Consultant:												
Plant Used: Length: 2.3 Width: 0.75												
Well	Water	Samples		Result	Depth	Level	Legend	Stratum Description	Depth m			
		Depth (m)	Type									
					0.20	93.30		Dark brown clayey sand with occasional rootlets Topsoil				
					0.50	93.00			0.5			
								Orangish brown firm sandy CLAY Upper Tunbridge Wells Sand	1.0			
					2.50	91.00		Firm to stiff orangish brown mottled light grey slightly sandy CLAY Becomes stiff at 1.5m bgl Upper Tunbridge Wells Sand	1.5			
									2.0			
									2.5			
									3.0			
									3.5			
									4.0			
									4.5			

LMB Ground Investigation Land Contamination Hydrogeology Engineering Geology		Trial Pit Log							SW5						
		Page 1 of 1													
		Project Name: Project No: N/A													
		Location: Co-ords: 532116.334 - 123723.134 Level: 94.67													
		Hole Type: TP Logged By: CH Dates: 12/08/2024 -													
Client: Consultant:															
Plant Used: Length: 2.3 Width: 0.7															
Well	Water	Samples		Result	Depth	Level	Legend	Stratum Description	Depth m						
		Depth (m)	Type												
					0.20	94.47		Dark brown clayey sand with occasional rootlets Topsoil	0.5						
					0.50	94.17									
												Firm orangish brown sandy CLAY Upper Tunbridge Wells Sand	1.5		
														2.00	92.67
														2.50	92.17
									2.0						
									2.5						
									3.0						
									3.5						
									4.0						
									4.5						

 Ground Investigation Land Contamination Hydrogeology Engineering Geology		Trial Pit Log							SW6				
		Page 1 of 1											
		Project Name: Project No: N/A											
		Location: Co-ords: 532094.469 - 123770.319 Level: 94.984											
		Hole Type: TP Logged By: CH Dates: 12/08/2024 -											
Client: Consultant:													
Plant Used: Length: 2.3 Width: 0.8													
Well	Water	Samples		Result	Depth	Level	Legend	Stratum Description	Depth m				
		Depth (m)	Type										
					0.20	94.78		Dark brown clayey sand with occasional rootlets Topsoil	-				
					0.40	94.58			0.5				
												Orangish brown firm sandy CLAY Upper Tunbridge Wells Sand	1.0
													1.5
													2.0
													2.30
					2.50	92.48	2.5						
												Recovered as coarse gravels and cobbles of SILTSTONE Upper Tunbridge Wells Sand	3.0
													3.5
													4.0
								4.5					

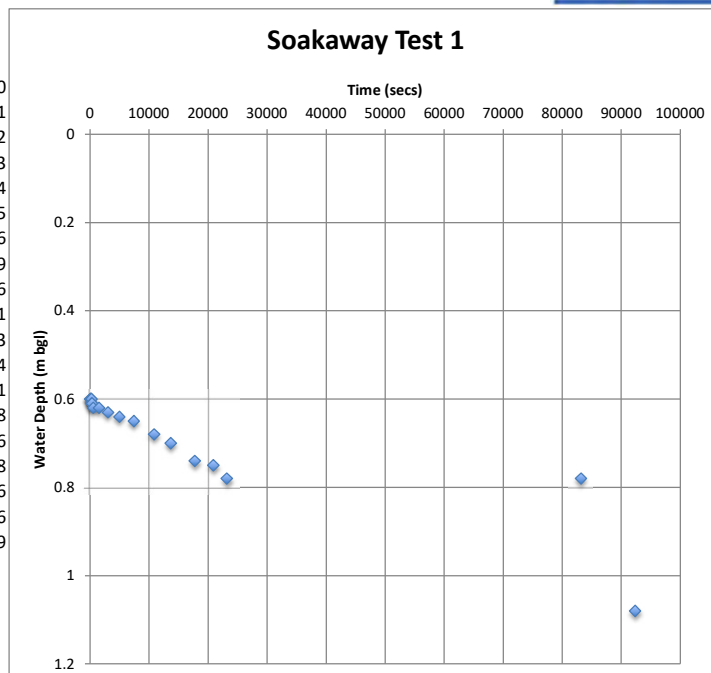
[illegible]

B Infiltration Test Worksheets

Soakaway Test (SW1)

(Based on BRE Digets 365: Soakaway Design)

depth (bgl)	time (sec)	min
0.6	0	0
0.6	60	1
0.6	120	2
0.6	180	3
0.61	240	4
0.61	300	5
0.62	360	6
0.62	540	9
0.63	1560	26
0.64	3060	51
0.65	4980	83
0.68	7440	124
0.7	10860	181
0.74	13680	228
0.75	17760	296
0.78	20880	348
0.78	23160	386
1.08	83160	1386
1.1	92340	1539

**Dimensions (m)**

Depth	2.1
Top Length	2.3
Base Length	2.3
Width	0.65

Infiltration Test Calculation

Soil Infiltration Rate

$$f = Vp75 - 25 / ap50 \times tp75 - 25 = 1.74E-06 \text{ m/s}$$

i) $Vp75 - 25$

Applying and effective storage depth of = 0.50

d25 = 0.725

d75 = 0.975

 $Vp75 - 25 = 0.37$ ii) $ap50$ $ap50 = 2.97 \text{ m}^2$ iii) $tp75 - 25$ $tp75 - 25 = 72300 \text{ seconds}$ **Notes**

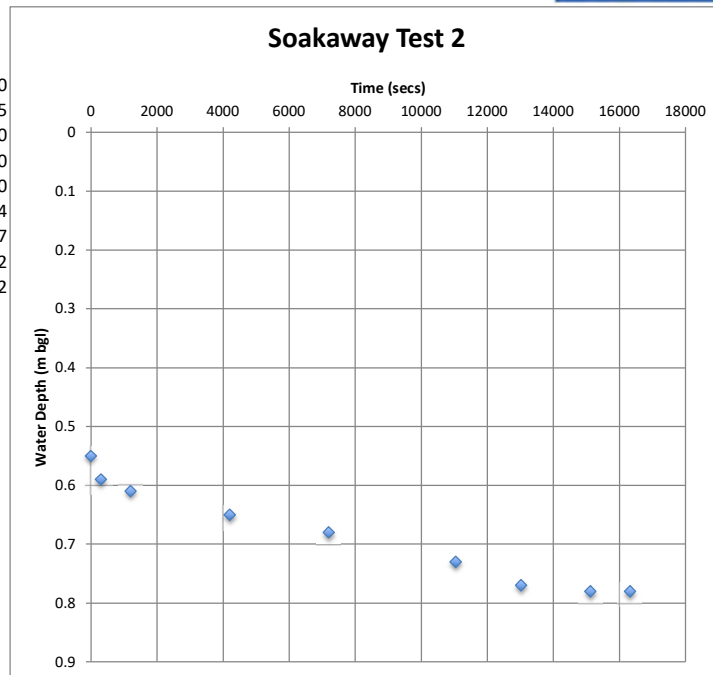
1. Invert Level assumed to be coincident with start depth of water.

2. Soil infiltration rate is calculated from the time taken for the water level to fall from **adjusted** 75% to 25% effective depth.

Soakaway Test (SW1)

(Based on BRE Digest 365: Soakaway Design)

depth (bgl)	time (sec)	min
0.55	0	0
0.59	300	5
0.61	1200	20
0.65	4200	70
0.68	7200	120
0.73	11040	184
0.77	13020	217
0.78	15120	252
0.78	16320	272

**Dimensions (m)**

Depth	2.1
Top Length	2.3
Base Length	2.3
Width	0.65

Infiltration Test Calculation

Soil Infiltration Rate

$$f = Vp75 - 25 / ap50 \times tp75 - 25 = 8.04E-06 \text{ m/s}$$

i) $Vp75 - 25$

Applying and effective storage depth of = 0.23

d25 = 0.6075

d75 = 0.7225

 $Vp75 - 25 = 0.17$ ii) $ap50$ $ap50 = 2.17 \text{ m}^2$ iii) $tp75 - 25$ $tp75 - 25 = 9840 \text{ seconds}$ **Notes**

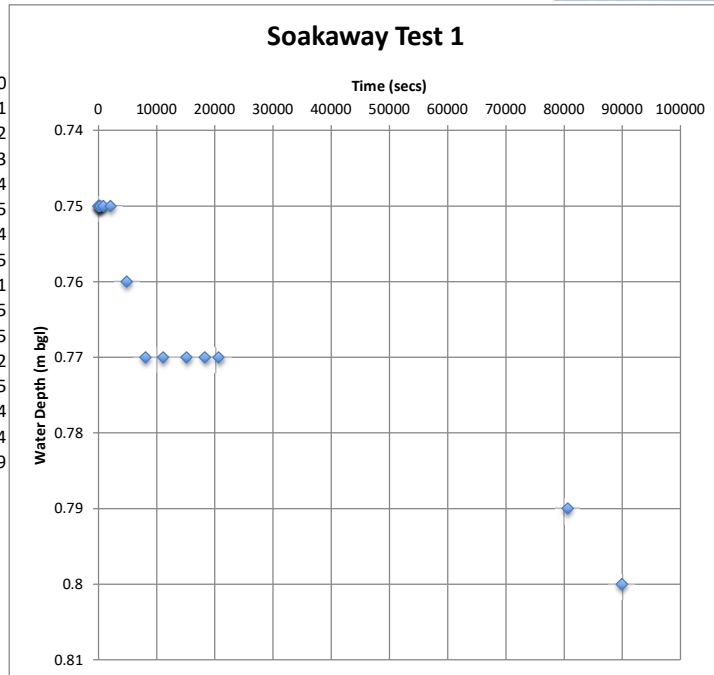
1. Invert Level assumed to be coincident with start depth of water.

2. Soil infiltration rate is calculated from the time taken for the water level to fall from **adjusted** 75% to 25% effective depth.

Soakaway Test (SW2)

(Based on BRE Digest 365: Soakaway Design)

depth (bgl)	time (sec)	min
0.75	0	0
0.75	60	1
0.75	120	2
0.75	180	3
0.75	240	4
0.75	300	5
0.75	840	14
0.75	2100	35
0.76	4860	81
0.77	8100	135
0.77	11100	185
0.77	15120	252
0.77	18300	305
0.77	20640	344
0.79	80640	1344
0.8	89940	1499

**Dimensions (m)**

Depth	2.5
Top Length	2
Base Length	2
Width	0.7

Infiltration Test Calculation

Soil Infiltration Rate

$$f = Vp75 - 25 / ap50 \times tp75 - 25 = 3.01E-07 \text{ m/s}$$

i) $Vp75 - 25$

Applying and effective storage depth of = 0.05

d25 = 0.7625

d75 = 0.7875

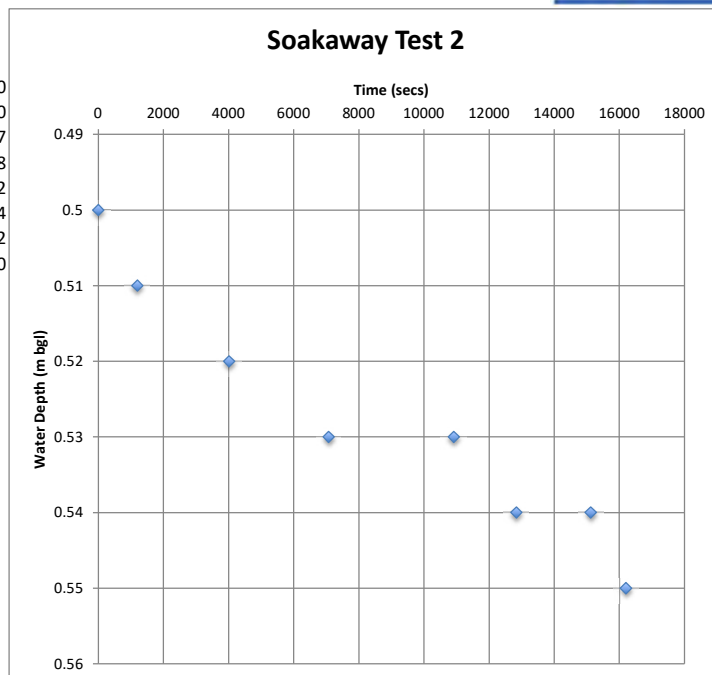
 $Vp75 - 25 = 0.04$ ii) $ap50$ $ap50 = 1.54 \text{ m}^2$ iii) $tp75 - 25$ $tp75 - 25 = 75780 \text{ seconds}$ **Notes**

1. Invert Level assumed to be coincident with start depth of water.
2. Soil infiltration rate is calculated from the time taken for the water level to fall from **adjusted** 75% to 25% effective depth.

Soakaway Test (SW2)

(Based on BRE Digest 365: Soakaway Design)

depth (bgl)	time (sec)	min
0.5	0	0
0.51	1200	20
0.52	4020	67
0.53	7080	118
0.53	10920	182
0.54	12840	214
0.54	15120	252
0.55	16200	270

**Dimensions (m)**

Depth	2.5
Top Length	2
Base Length	2
Width	0.7

Infiltration Test Calculation

Soil Infiltration Rate

$$f = Vp75 - 25 / ap50 \times tp75 - 25 = 1.96E-06 \text{ m/s}$$

i) $Vp75 - 25$

Applying and effective storage depth of = 0.05

d25 = 0.5125

d75 = 0.5375

 $Vp75 - 25 = 0.04$ ii) $ap50$ $ap50 = 1.54 \text{ m}^2$ iii) $tp75 - 25$ $tp75 - 25 = 11640 \text{ seconds}$ **Notes**

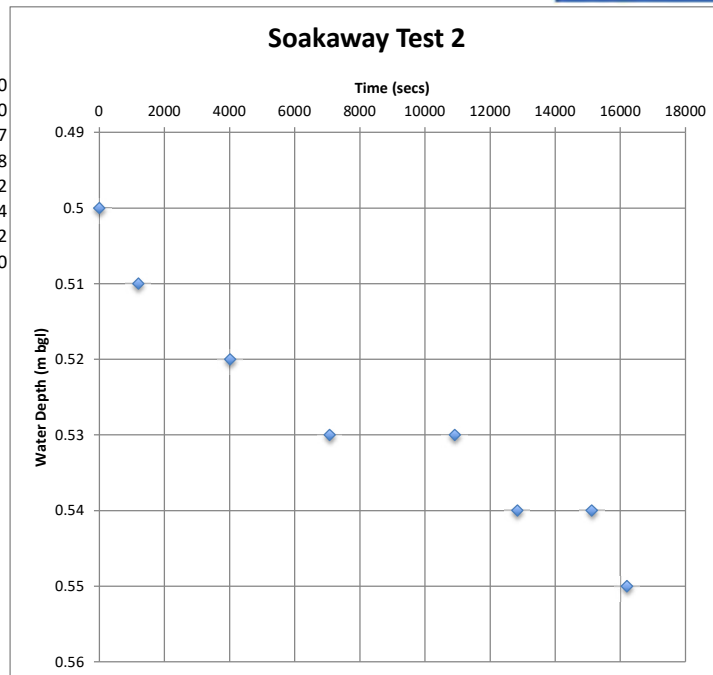
1. Invert Level assumed to be coincident with start depth of water.

2. Soil infiltration rate is calculated from the time taken for the water level to fall from **adjusted** 75% to 25% effective depth.

**Soakaway Test (SW2)**

(Based on BRE Digest 365: Soakaway Design)

depth (bgl)	time (sec)	min
0.5	0	0
0.51	1200	20
0.52	4020	67
0.53	7080	118
0.53	10920	182
0.54	12840	214
0.54	15120	252
0.55	16200	270

**Dimensions (m)**

Depth	2.5
Top Length	2
Base Length	2
Width	0.7

Infiltration Test Calculation

Soil Infiltration Rate

$$f = Vp75 - 25 / ap50 \times tp75 - 25 = 1.96E-06 \text{ m/s}$$

i) $Vp75 - 25$

Applying and effective storage depth of = 0.05

d25 = 0.5125

d75 = 0.5375

 $Vp75 - 25 = 0.04$ ii) $ap50$ $ap50 = 1.54 \text{ m}^2$ iii) $tp75 - 25$ $tp75 - 25 = 11640 \text{ seconds}$ **Notes**

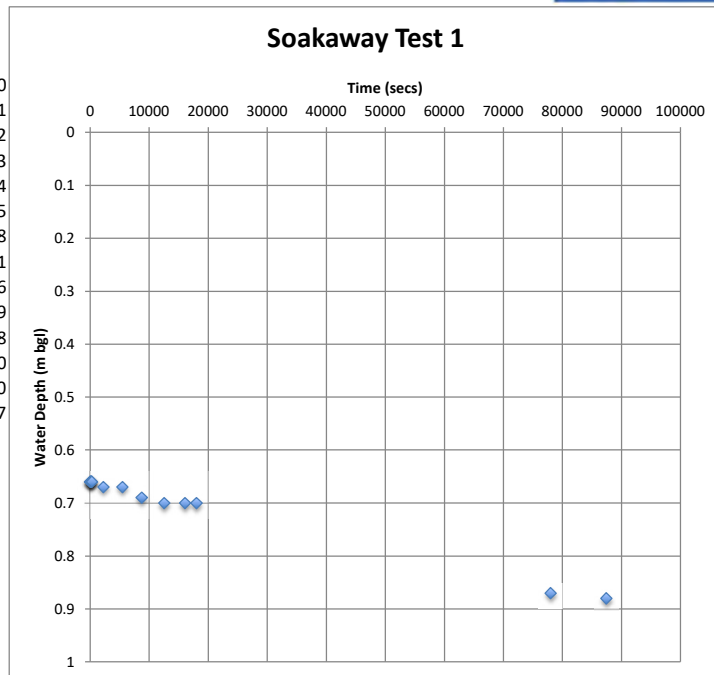
1. Invert Level assumed to be coincident with start depth of water.

2. Soil infiltration rate is calculated from the time taken for the water level to fall from **adjusted** 75% to 25% effective depth.

Soakaway Test (SW3)

(Based on BRE Digest 365: Soakaway Design)

depth (bgl)	time (sec)	min
0.66	0	0
0.66	60	1
0.66	120	2
0.66	180	3
0.66	240	4
0.66	300	5
0.67	2280	38
0.67	5460	91
0.69	8760	146
0.7	12540	209
0.7	16080	268
0.7	18000	300
0.87	78000	1300
0.88	87420	1457

**Dimensions (m)**

Depth	2.5
Top Length	2.1
Base Length	2.1
Width	0.7

Infiltration Test Calculation

Soil Infiltration Rate

$$f = V_{p75 - 25} / a_{p50} \times t_{p75 - 25} =$$

1.18E-06 m/si) $V_{p75 - 25}$

Applying and effective storage depth of = 0.22

d25 = 0.715

d75 = 0.825

 $V_{p75 - 25} = 0.16$ ii) a_{p50} $a_{p50} = 2.09 \text{ m}^2$ iii) $t_{p75 - 25}$ $t_{p75 - 25} = 65460 \text{ seconds}$ **Notes**

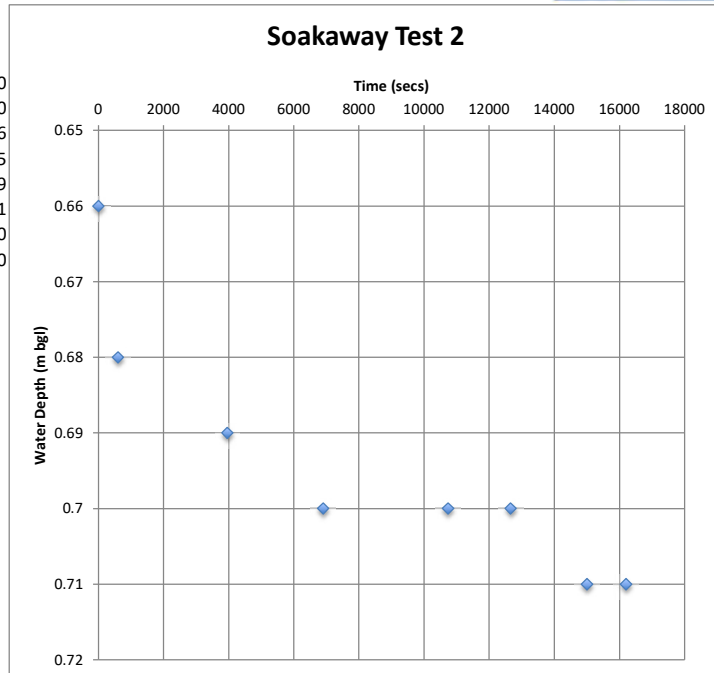
1. Invert Level assumed to be coincident with start depth of water.

2. Soil infiltration rate is calculated from the time taken for the water level to fall from **adjusted** 75% to 25% effective depth.

Soakaway Test (SW3)

(Based on BRE Digets 365: Soakaway Design)

depth (bgl)	time (sec)	min
0.66	0	0
0.68	600	10
0.69	3960	66
0.7	6900	115
0.7	10740	179
0.7	12660	211
0.71	15000	250
0.71	16200	270

**Dimensions (m)**

Depth	2.5
Top Length	2.1
Base Length	2.1
Width	0.7

Infiltration Test Calculation

Soil Infiltration Rate

$$f = Vp75 - 25 / ap50 \times tp75 - 25 = 3.62E-06 \text{ m/s}$$

i) $Vp75 - 25$

Applying and effective storage depth of = 0.05

d25 = 0.6725

d75 = 0.6975

 $Vp75 - 25 = 0.04$ ii) $ap50$ $ap50 = 1.61 \text{ m}^2$ iii) $tp75 - 25$ $tp75 - 25 = 6300 \text{ seconds}$ **Notes**

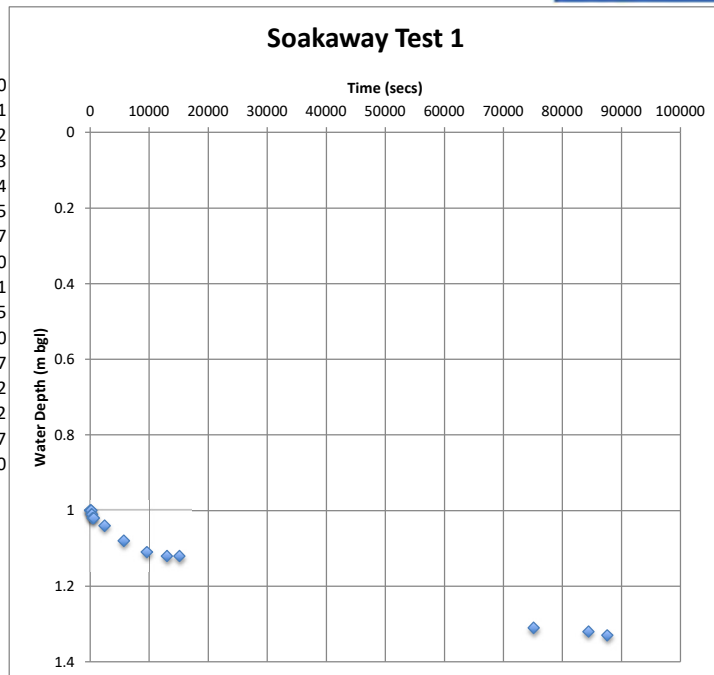
1. Invert Level assumed to be coincident with start depth of water.

2. Soil infiltration rate is calculated from the time taken for the water level to fall from **adjusted** 75% to 25% effective depth.

Soakaway Test (SW4)

(Based on BRE Digest 365: Soakaway Design)

depth (bgl)	time (sec)	min
1	0	0
1	60	1
1	120	2
1	180	3
1.01	240	4
1.01	300	5
1.02	420	7
1.02	600	10
1.04	2460	41
1.08	5700	95
1.11	9600	160
1.12	13020	217
1.12	15120	252
1.31	75120	1252
1.32	84420	1407
1.33	87600	1460

**Dimensions (m)**

Depth	2.5
Top Length	2.3
Base Length	2.3
Width	0.75

Infiltration Test Calculation

Soil Infiltration Rate

$$f = Vp75 - 25 / ap50 \times tp75 - 25 = 1.50E-06 \text{ m/s}$$

i) $Vp75 - 25$

Applying and effective storage depth of = 0.33

d25 = 1.0825

d75 = 1.2475

 $Vp75 - 25 = 0.28$ ii) $ap50$ $ap50 = 2.73 \text{ m}^2$ iii) $tp75 - 25$ $tp75 - 25 = 69420 \text{ seconds}$ **Notes**

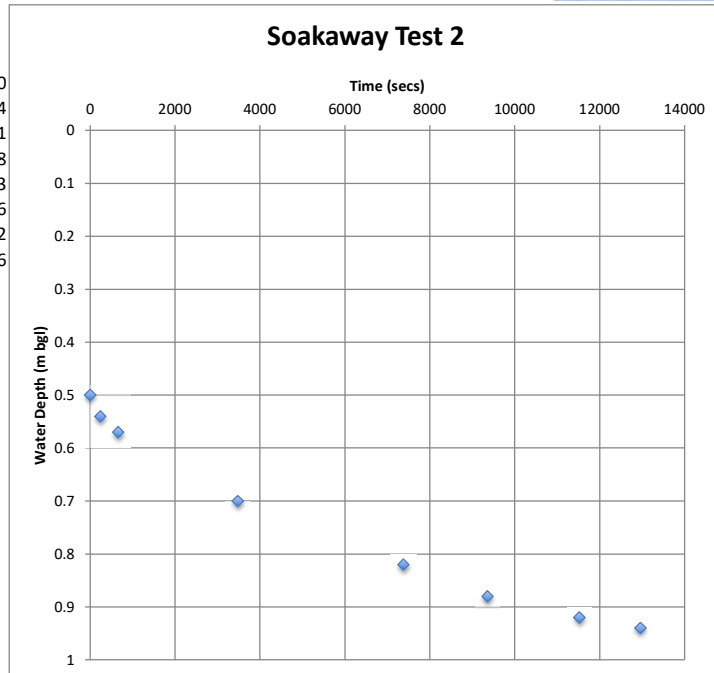
1. Invert Level assumed to be coincident with start depth of water.

2. Soil infiltration rate is calculated from the time taken for the water level to fall from **adjusted** 75% to 25% effective depth.

Soakaway Test (SW4)

(Based on BRE Digest 365: Soakaway Design)

depth (bgl)	time (sec)	min
0.5	0	0
0.54	240	4
0.57	660	11
0.7	3480	58
0.82	7380	123
0.88	9360	156
0.92	11520	192
0.94	12960	216

**Dimensions (m)**

Depth	2.5
Top Length	2.3
Base Length	2.3
Width	0.75

Infiltration Test Calculation

Soil Infiltration Rate

$$f = V_{p75 - 25} / a_{p50} \times t_{p75 - 25} =$$

1.84E-05 m/si) $V_{p75 - 25}$

Applying and effective storage depth of = 0.44

d25 = 0.61

d75 = 0.83

 $V_{p75 - 25} = 0.38$ ii) a_{p50} $a_{p50} = 3.07 \text{ m}^2$ iii) $t_{p75 - 25}$ $t_{p75 - 25} = 6720 \text{ seconds}$ **Notes**

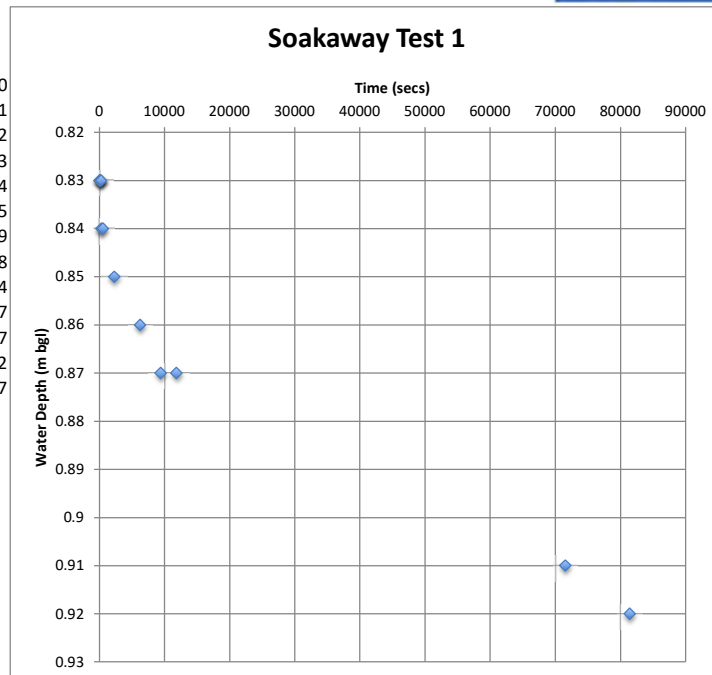
1. Invert Level assumed to be coincident with start depth of water.

2. Soil infiltration rate is calculated from the time taken for the water level to fall from **adjusted** 75% to 25% effective depth.

Soakaway Test (SW5)

(Based on BRE Digest 365: Soakaway Design)

depth (bgl)	time (sec)	min
0.83	0	0
0.83	60	1
0.83	120	2
0.83	180	3
0.83	240	4
0.84	300	5
0.84	540	9
0.85	2280	38
0.86	6240	104
0.87	9420	157
0.87	11820	197
0.91	71520	1192
0.92	81420	1357

**Dimensions (m)**

Depth	2.5
Top Length	2.3
Base Length	2.3
Width	0.7

Infiltration Test Calculation

Soil Infiltration Rate

$$f = Vp75 - 25 / ap50 \times tp75 - 25 = 5.57E-07 \text{ m/s}$$

i) $Vp75 - 25$

Applying and effective storage depth of = 0.09

d25 = 0.8525

d75 = 0.8975

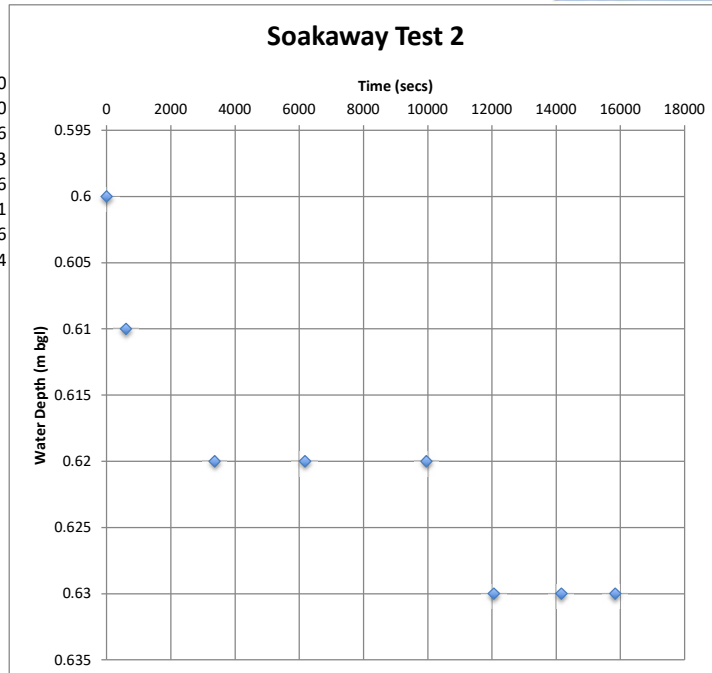
 $Vp75 - 25 = 0.07$ ii) $ap50$ $ap50 = 1.88 \text{ m}^2$ iii) $tp75 - 25$ $tp75 - 25 = 69240 \text{ seconds}$ **Notes**

1. Invert Level assumed to be coincident with start depth of water.
2. Soil infiltration rate is calculated from the time taken for the water level to fall from **adjusted** 75% to 25% effective depth.

Soakaway Test (SW5)

(Based on BRE Digest 365: Soakaway Design)

depth (bgl)	time (sec)	min
0.6	0	0
0.61	600	10
0.62	3360	56
0.62	6180	103
0.62	9960	166
0.63	12060	201
0.63	14160	236
0.63	15840	264



Dimensions (m)

Depth	2.5
Top Length	2.3
Base Length	2.3
Width	0.7

Infiltration Test Calculation

Soil Infiltration Rate

$$f = V_{p75 - 25} / a_{p50} \times t_{p75 - 25} = 1.24E-06 \text{ m/s}$$

i) $V_{p75 - 25}$

Applying and effective storage depth of = 0.03

$d_{25} = 0.6075$

$d_{75} = 0.6225$

$V_{p75 - 25} = 0.02$

ii) a_{p50}

$a_{p50} = 1.70 \text{ m}^2$

iii) $t_{p75 - 25}$

$t_{p75 - 25} = 11460 \text{ seconds}$

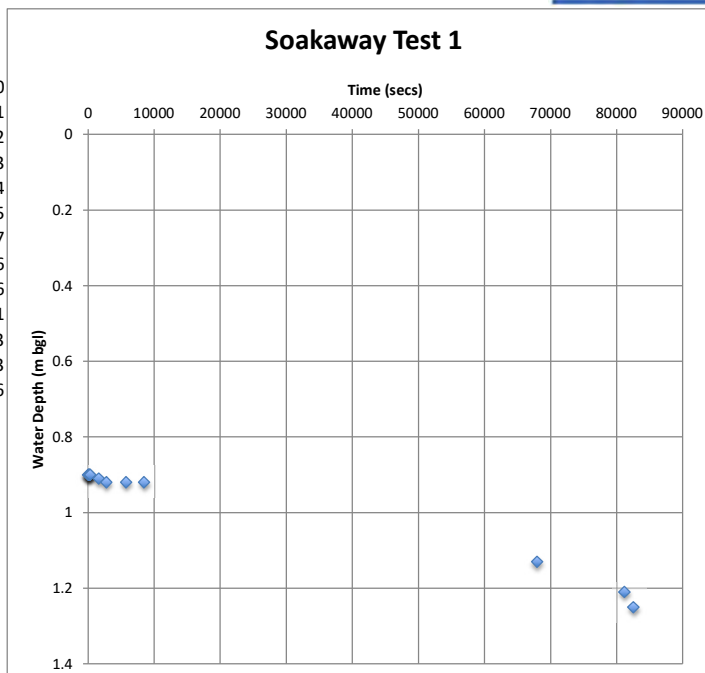
Notes

1. Invert Level assumed to be coincident with start depth of water.
2. Soil infiltration rate is calculated from the time taken for the water level to fall from **adjusted** 75% to 25% effective depth.

Soakaway Test (SW6)

(Based on BRE Digets 365: Soakaway Design)

depth (bgl)	time (sec)	min
0.9	0	0
0.9	60	1
0.9	120	2
0.9	180	3
0.9	240	4
0.9	300	5
0.91	1620	27
0.92	2760	46
0.92	5760	96
0.92	8460	141
1.13	67980	1133
1.21	81180	1353
1.25	82560	1376

**Dimensions (m)**

Depth	2.5
Top Length	2.3
Base Length	2.3
Width	0.8

Infiltration Test Calculation

Soil Infiltration Rate

$$f = V_{p75 - 25} / a_{p50} \times t_{p75 - 25} = 1.63E-06 \text{ m/s}$$

i) $V_{p75 - 25}$

Applying and effective storage depth of = 0.35

d25 = 0.9875

d75 = 1.1625

 $V_{p75 - 25} = 0.32$ ii) a_{p50} $a_{p50} = 2.93 \text{ m}^2$ iii) $t_{p75 - 25}$ $t_{p75 - 25} = 67680 \text{ seconds}$ **Notes**

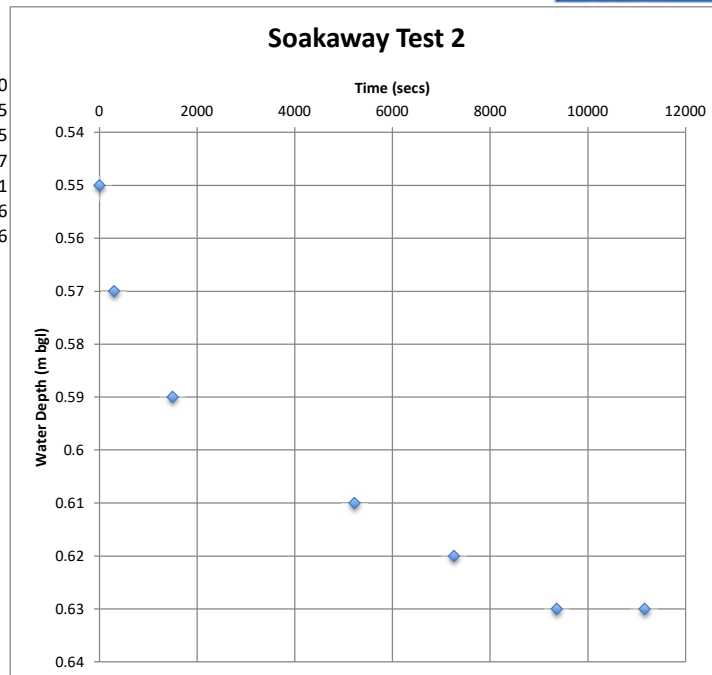
1. Invert Level assumed to be coincident with start depth of water.

2. Soil infiltration rate is calculated from the time taken for the water level to fall from **adjusted** 75% to 25% effective depth.

**Soakaway Test (SW6)**

(Based on BRE Digest 365: Soakaway Design)

depth (bgl)	time (sec)	min
0.55	0	0
0.57	300	5
0.59	1500	25
0.61	5220	87
0.62	7260	121
0.63	9360	156
0.63	11160	186

**Dimensions (m)**

Depth	2.5
Top Length	2.3
Base Length	2.3
Width	0.8

Infiltration Test Calculation

Soil Infiltration Rate

$$f = V_{p75 - 25} / a_{p50} \times t_{p75 - 25} = 7.16E-06 \text{ m/s}$$

i) $V_{p75 - 25}$

Applying and effective storage depth of = 0.08

d25 = 0.57

d75 = 0.61

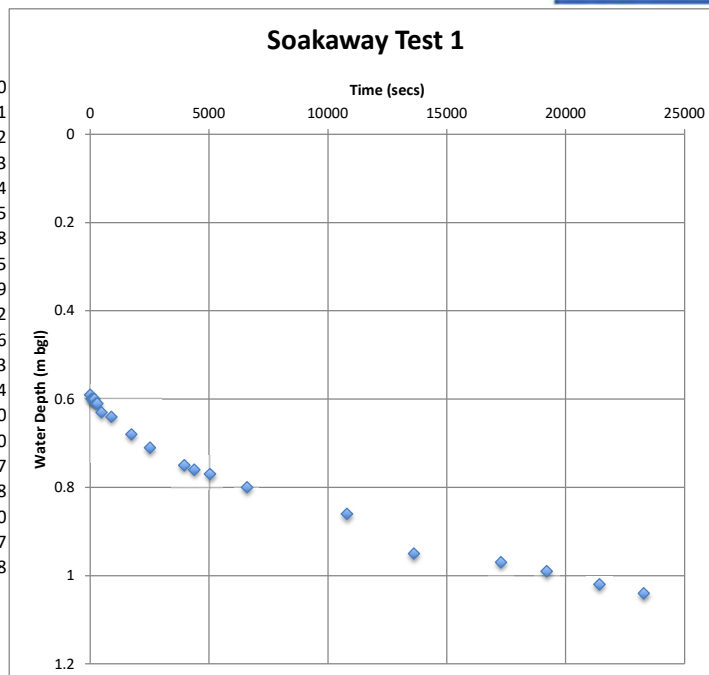
 $V_{p75 - 25} = 0.07$ ii) a_{p50} $a_{p50} = 2.09 \text{ m}^2$ iii) $t_{p75 - 25}$ $t_{p75 - 25} = 4920 \text{ seconds}$ **Notes**

1. Invert Level assumed to be coincident with start depth of water.
2. Soil infiltration rate is calculated from the time taken for the water level to fall from **adjusted** 75% to 25% effective depth.

Soakaway Test (SW7)

(Based on BRE Digets 365: Soakaway Design)

depth (bgl)	time (sec)	min
0.59	0	0
0.6	60	1
0.6	120	2
0.6	180	3
0.61	240	4
0.61	300	5
0.63	480	8
0.64	900	15
0.68	1740	29
0.71	2520	42
0.75	3960	66
0.76	4380	73
0.77	5040	84
0.8	6600	110
0.86	10800	180
0.95	13620	227
0.97	17280	288
0.99	19200	320
1.02	21420	357
1.04	23280	388

**Dimensions (m)**

Depth	2.1
Top Length	2.2
Base Length	2.2
Width	0.7

Infiltration Test Calculation

Soil Infiltration Rate

$$f = Vp75 - 25 / ap50 \times tp75 - 25 = 1.10E-05 \text{ m/s}$$

i) $Vp75 - 25$

Applying and effective storage depth of = 0.45

d25 = 0.7025

d75 = 0.9275

 $Vp75 - 25 = 0.35$ ii) $ap50$ $ap50 = 2.85 \text{ m}^2$ iii) $tp75 - 25$ $tp75 - 25 = 11100 \text{ seconds}$ **Notes**

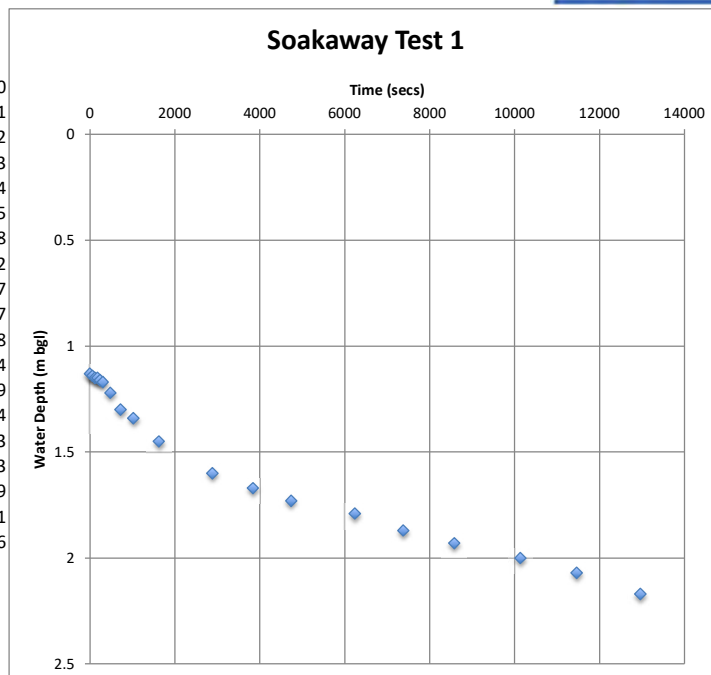
1. Invert Level assumed to be coincident with start depth of water.

2. Soil infiltration rate is calculated from the time taken for the water level to fall from **adjusted** 75% to 25% effective depth.

Soakaway Test (SW8)

(Based on BRE Digest 365: Soakaway Design)

depth (bgl)	time (sec)	min
1.13	0	0
1.14	60	1
1.15	120	2
1.15	180	3
1.16	240	4
1.17	300	5
1.22	480	8
1.3	720	12
1.34	1020	17
1.45	1620	27
1.6	2880	48
1.67	3840	64
1.73	4740	79
1.79	6240	104
1.87	7380	123
1.93	8580	143
2	10140	169
2.07	11460	191
2.17	12960	216

**Dimensions (m)**

Depth	2.5
Top Length	2.2
Base Length	2.2
Width	0.7

Infiltration Test Calculation

Soil Infiltration Rate

$$f = Vp75 - 25 / ap50 \times tp75 - 25 = 1.69E-05 \text{ m/s}$$

i) $Vp75 - 25$

Applying and effective storage depth of = 1.37

d25 = 1.4725

d75 = 2.1575

 $Vp75 - 25 = 1.05$ ii) $ap50$ $ap50 = 5.51 \text{ m}^2$ iii) $tp75 - 25$ $tp75 - 25 = 11340 \text{ seconds}$ **Notes**

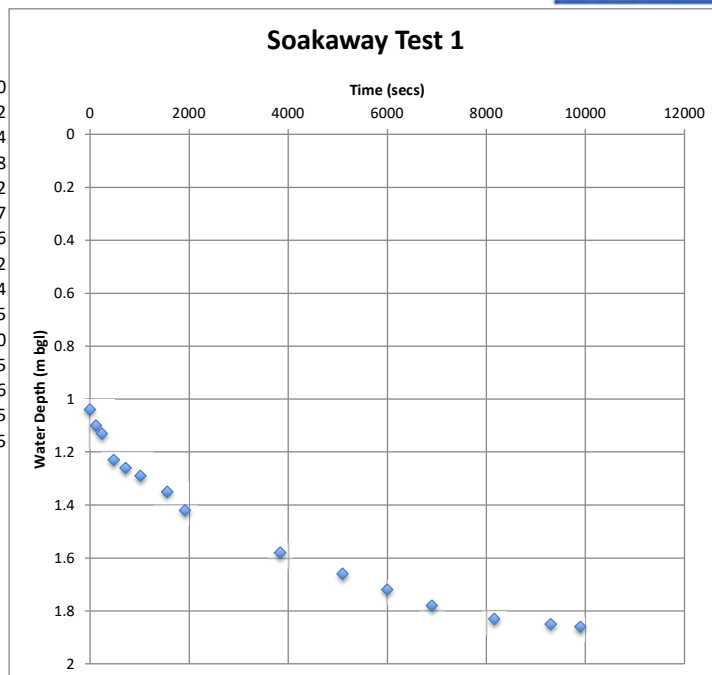
1. Invert Level assumed to be coincident with start depth of water.

2. Soil infiltration rate is calculated from the time taken for the water level to fall from 75% to 25% effective depth.

**Soakaway Test (SW8)**

(Based on BRE Digest 365: Soakaway Design)

depth (bgl)	time (sec)	min
1.04	0	0
1.1	120	2
1.13	240	4
1.23	480	8
1.26	720	12
1.29	1020	17
1.35	1560	26
1.42	1920	32
1.58	3840	64
1.66	5100	85
1.72	6000	100
1.78	6900	115
1.83	8160	136
1.85	9300	155
1.86	9900	165

**Dimensions (m)**

Depth	2.5
Top Length	2.2
Base Length	2.2
Width	0.7

Infiltration Test Calculation

Soil Infiltration Rate

$$f = Vp75 - 25 / ap50 \times tp75 - 25 = 3.49E-05 \text{ m/s}$$

i) $Vp75 - 25$

Applying and effective storage depth of = 0.82

d25 = 1.245

d75 = 1.655

 $Vp75 - 25 = 0.63$ ii) $ap50$ $ap50 = 3.92 \text{ m}^2$ iii) $tp75 - 25$ $tp75 - 25 = 4620 \text{ seconds}$ **Notes**

1. Invert Level assumed to be coincident with start depth of water.

2. Soil infiltration rate is calculated from the time taken for the water level to fall from **adjusted** 75% to 25% effective depth.



Photo 1 – SW1 excavation



Photo 2 – SW1 arisings



Ground Investigation
Land Contamination
Hydrogeology
Engineering Geology

Photographic Record

Project: Downlands
Park

Photos 1 & 2



Photo 3 – SW2 excavation

Photo 4 – SW2 arisings



Ground Investigation
Land Contamination
Hydrogeology
Engineering Geology

Photographic Record

Project: Downlands
Park

Photos 3 & 4



Photo 5 – SW3 excavation



Photo 6 – SW3 arisings



Ground Investigation
Land Contamination
Hydrogeology
Engineering Geology

Photographic Record

Project: Downlands
Park

Photos 5 & 6



Photo 7 – SW4 excavation



Photo 8 – SW4 arisings



Ground Investigation
Land Contamination
Hydrogeology
Engineering Geology

Photographic Record

Project: Downlands
Park

Photos 7 & 8



Photo 9 – SW5 excavation



Photo 10 – SW5 arisings



Ground Investigation
Land Contamination
Hydrogeology
Engineering Geology

Photographic Record

Project: Downlands
Park

Photos 9 & 10



Photo 11 – SW6 excavation

Photo 12 – SW6 arisings



Ground Investigation
Land Contamination
Hydrogeology
Engineering Geology

Photographic Record

Project: Downlands
Park

Photos 11 & 12



Photo 13 – SW7 excavation



Photo 14 – SW7 arisings

LMB



Ground Investigation
Land Contamination
Hydrogeology
Engineering Geology

Photographic Record

Project: Downlands
Park

Photos 13 & 14



Photo 15 – SW8 excavation



Photo 16 – SW8 arisings



Ground Investigation
Land Contamination
Hydrogeology
Engineering Geology

Photographic Record

Project: Downlands
Park

Photos 15 & 16

APPENDIX D

DRAINAGE STRATEGY

APPENDIX E

FOUL WATER STRATEGY



Job Title
Downlands Park
Haywards Heath
RH16 4BQ

Drawing Title
Foul Water Drainage
General Arrangement

Project	Company	Zones	Level	Type	Role	Number
21279	- SYM	- XX	- XX	- DR	- C	- 0301
Scale: 1 : 500 @ A1			Drawn By: CE		Revision :	
Date: Oct 2024			Checked By: RF		P1	

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PLEASE GET IN TOUCH ON 020 8340 4041
OR EMAIL US AT [INFO@SYMMETRYS.COM](mailto:info@symmetrys.com)**