Document Issue Record

Location:	Old Loom Mill, Earsham Road, Halisham BN27 2RH				
Application:	Demolition of existing buildings in B1/B8 usage and café, followed by erection of 24 no. family houses				
Prepared for:	Aitco Ltd				
Title:	Technical Note				
Project No.:	89594	**Date:**	18th January 2021	**Issue No.:**	1.0
Written By:	A. Rousou, BSc (Hons) P.S. Gander	**Checked By:**	E. Bouet, BSc (Hons)	**Authorised By:**	E. Bouet, BSc (Hons) P.S. Gander

1. Introduction

1.1. This Technical Note has been prepared by Unda Consulting Limited on behalf of Aitco Ltd, to address the concerns of Matthew Taylor of Wealden District Council.

1.2. The associated planning application relates to *Demolition of existing buildings in B1/B8 usage and café, followed by erection of 24 no. family houses.* These works are proposed to be undertaken at Old Loom Mill, Earsham Road, Halisham BN27 2RH.

1.3. Post development the total roof area of the twenty four new residential dwellings and two car ports will amount to approximately 2240m².

2. Existing Site:

2.1. The site is occupied by a former mill and is approximately 14631m² in size.

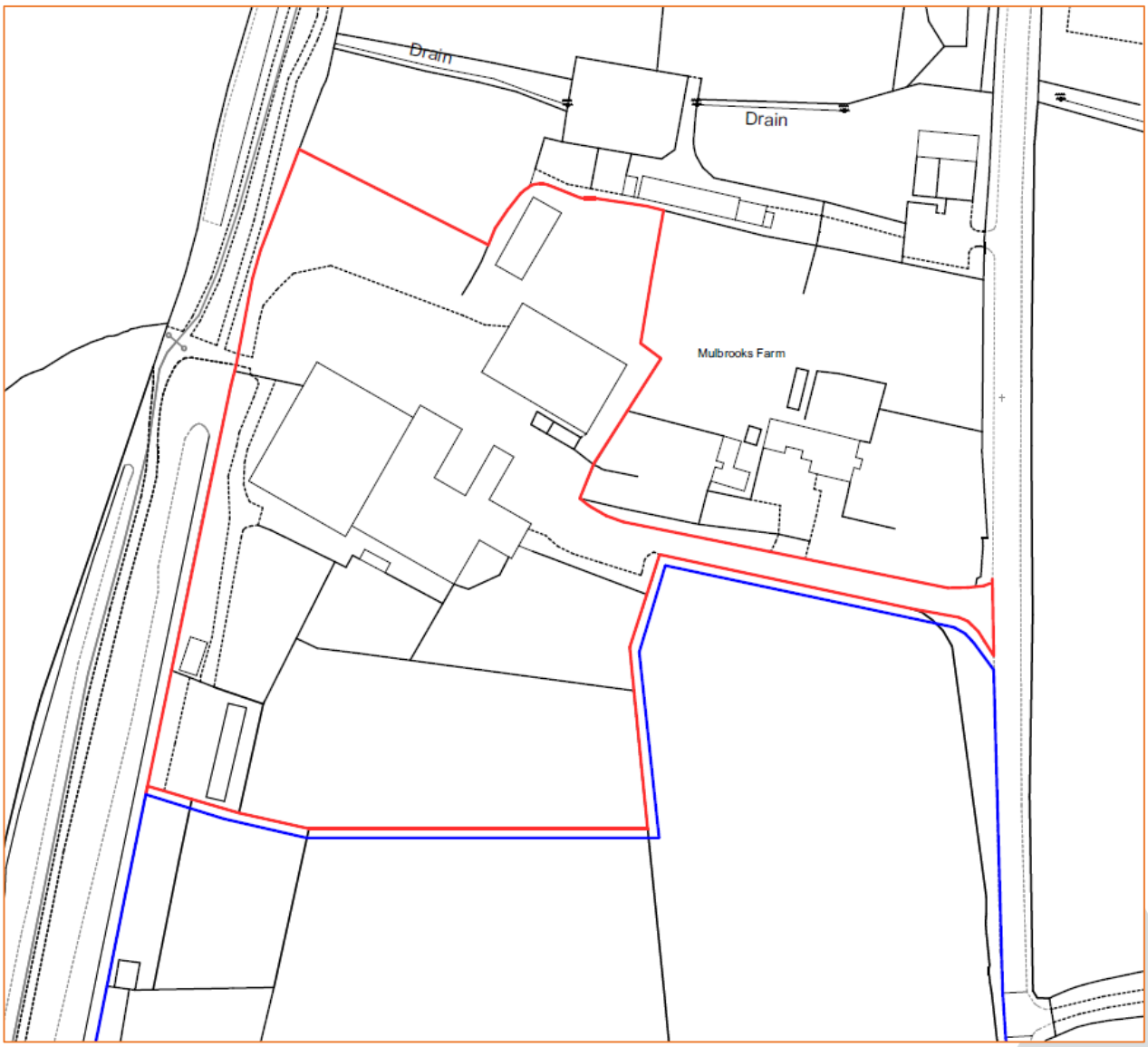

Figure 1: Site Location (Source: Ecotecture)

Figure 2: Aerial Imagery (Source: Google)

Site Topography:

2.2. A measured topographical survey has been undertaken at the site and provided by the client for inclusion within the report. This indicates that levels on site range between 4.71mAOD in the north and 10.79mAOD in the south west.

2.3. According to spot height levels, the site appears to generally slope from land in the south towards the northern periphery.

2.4. Based on the plans provided, the twenty four residential dwellings are proposed to be development upon land with an approximate elevation of between 4.82mAOD and 8.54mAOD.

Existing Ground Conditions:

2.5. Test results provided by Southern Testing Ltd indicate that all four Trial Pits failed to drain thus failed to complete the necessary drop in level (25% full) to calculate a compliant value for infiltration.

3. Development Proposals:

Proposed Development:

3.1. The proposed planning application is for redevelopment of the site with construction of twenty four new residential dwellings, with associated access road and parking.

3.2. Attenuation sizing within the strategy has been based on all newly introduced impermeable surfacing (6441m^2), comprising both post development roof area and hardstanding. Thus significant betterment will be provided post development.

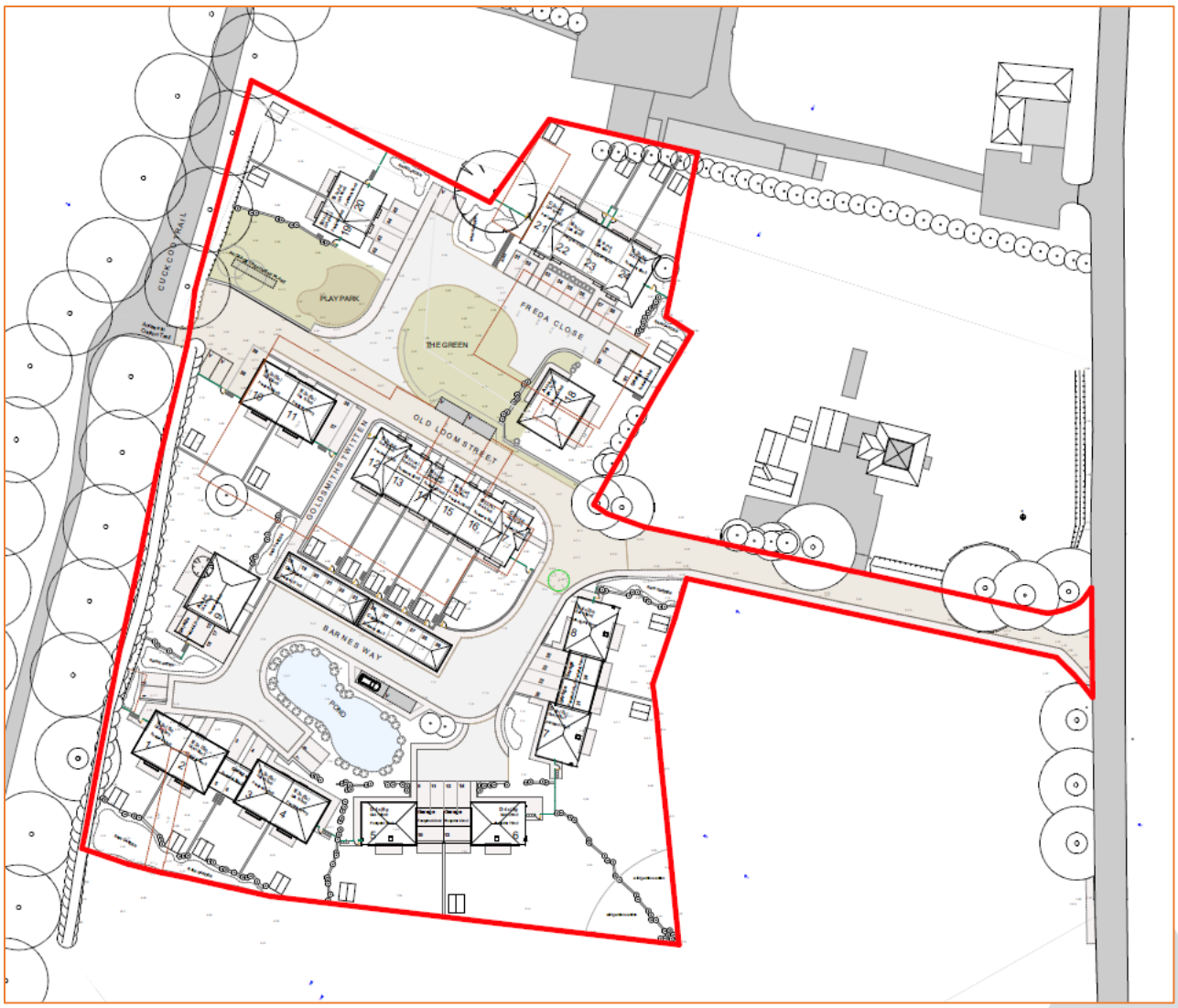

Figure 3: Proposed Site Layout Plan (Source: Ecotecture)

4. Surface Water Drainage Calculations and Maintenance:

Discharge Location:

4.1. Utilising the northern connection for post development runoff also corresponds with East Sussex County Council's consultation comments, dated 13th October 2017, which state:

Our preference is for the northern outfall to be used as this involves a short section of sewer and then discharges directly to the watercourse, unless the eastern outfall is proven to have significant benefits. We would request that each of the outfalls is investigated and the most appropriate outfall selected prior to the layout being fixed through any Reserved Matters application. This will also depend on the topography of the site.

Proposed Discharge Rate:

4.2. Existing greenfield runoff rates for the site have been calculated as 6.4 l/s for the 1:1 annual runoff event, 17.0 l/s for the 1:30 year event and 24.0 l/s for the 1:100 year event. Refer to calculations in appendix.

4.3. East Sussex County Council consultation response WD/2017/0839/MAO, dated 13th October 2017 states *surface water runoff from the proposed development should be limited to the 3.2 l/s, for all rainfall events, including those with a 1 in 100 (plus climate change) annual probability of occurrence.*

4.4. In light of this, it is proposed to discharge post development runoff to watercourse at a maximum rate of 3.2l/s using a Hydro-Brake.

Proposed SuDS:

4.5. The client has confirmed that they would like to incorporate rain gardens and a pond within the proposed scheme. In order to provide sufficient storage to accommodate all post development runoff during the 1 in 100 year plus climate change event a number of separate SuDS features are proposed within the project.

4.6. Below is a summary of the proposed mechanisms of surface water drainage at the site for each element of the scheme.

Element	Raingarden	Pond	Tanked Permeable Paving	Attenuation Storage Tank
Road, Paving and Parking				
Roof Area: Plots 1 – 4				
Roof Area: Plots 5 - 6				
Roof Area: Plots 7 – 8				
Roof Area: Plot 9				
Roof Area: Plots 10 – 24				
Car Ports				

Tanked Permeable Paving :

4.7. Part of the proposed access road will be surfaced in tanked permeable paving amounting to 2342m^2. Runoff from this area will percolate through the paving and be stored within a gravel sub-base. Check dams will be utilised within the sub-base where the topography is on a gradient, so as to maximise storage potential.

4.8. All water within the tanked permeable paving sub-base will be gradually discharged to the watercourse some 35m north of the site via outflow device.

4.9. Surface water runoff from the remaining impermeable element of the access road (479m^2), proposed paving (1380m^2) and the roof areas of plots 7 and 8 (241m^2), will also be directed to the area of tanked permeable paving.

4.10. In order to comply with CIRIA C753 The SuDS Manual, a 10% allowance needs to be added to the roof area of plots 7 and 8 to take into account future urban creep. Applying a 10% allowance to the roof areas of plots 7 and 8 (241m^2) gives a value of 265.1m^2.

4.11. In light of this all drainage calculations for sizing the tanked permeable paving have been made on the basis of a total impermeable area of 4466.1m^2 (2821m^2 of access road, 1380m^2 of paving and 265.1m^2 of roof area).

4.12. Outflow from the proposed drainage system (tanked permeable paving) to the drainage ditch will be limited to 2.1 l/s for all storms up to, and including, the 1:100 year + 40% climate change event via a hydrobrake. The hydrobrake will be installed in an inspection chamber within the site.

4.13. Preliminary calculations indicate that tanked permeable pavement with dimensions of 2342m^2 x 0.5m deep x 0.3 (voids) will be sufficient to accommodate all runoff from 4201m^2 of impermeable surfacing and 265.1m^2 of roof area arising from the critical 1:100 year + 40% Climate Change event.

4.14. Preliminary calculations indicate that some 342.0m^3 of storage is required to attenuate the runoff for all storms up to and including the 1:100 year + 40% Climate Change event.

4.15. Refer to enclosed MicroDrainage calculations.

4.16. The highest pollution hazard level for the proposed land use is Low (residential car parks and low trafficked roads). The pollution hazard indices for this land use are shown in Table 1 below.

Total suspended solids (TSS)	Metals	Hydrocarbons
0.5	0.4	0.4

Table 1: Pollution Hazard Indices for the proposed site (from Table 26.2 of CIRIA C753 The SuDS Manual)

4.17. All SuDS components are assessed for their effectiveness in pollutant removal prior to discharge to sewer in Table 26.3 in CIRIA C753 The SuDS Manual. The pollution mitigation indices for permeable paving are show in Table 2 below.

Total suspended solids (TSS)	Metals	Hydrocarbons
0.7	0.6	0.7

Table 2: Pollution Mitigation Indices for permeable pavements (from Table 26.3 of CIRIA C753 The SuDS Manual)

4.18. The Pollution Mitigation Indices for permeable pavement are greater than the Pollution Hazard Indices for car parks and low trafficked roads. Therefore, permeable pavements will provide sufficient water quality treatment prior to discharge.

Raingardens (Bioretention):

4.19. According to landscape plans, several areas have been made available for the incorporation of above ground SuDS.

4.20. It is proposed to utilise two of these designated areas to install raingardens. Raingardens offer a form of attenuation storage whilst providing biodiversity and amenity benefits. According to CIRIA SuDS Manual raingardens also provide a very effective treatment functionality through the removal of sediments and pollutants by filtration through the vegetation and underlying filter mediums.

4.21. Two rain gardens will be constructed, one in the south western corner of the site and one in the west, to accept roof runoff from plots 1 to 4 and plot 9, respectively.

4.22. Given that both raingardens are to be designed to accept roof runoff a 10% allowance needs to be added to comply with CIRIA C753: future urban creep. Applying a 10% allowance to the roof areas of plots 1 to 4 and plot 9 (341m^2 and 148m^2) gives values of 375.1m^2 and 162.8m^2, respectively.

4.23. Based upon plans provided, the rain garden in the south western corner will have a surface area of 129m^2 and will be of sufficient size to accommodate surface water runoff from the roof areas (including urban creep allowance) of plots 1 to 4 during the 1 in 100 year plus (40%) climate change event.

4.24. The second rain garden, in the west, will reportedly cover an area of 38m^2. Whilst this rain garden is proposed to have a shallower sub-base and freeboard, it has also been designed to be of sufficient size to accommodate all runoff from roof areas associated with plot 9 for the 1 in 100 year plus (40%) climate change event.

4.25. Stones and gravel will be laid at the inlet of both rain gardens to dissipate the energy of entering water and prevent heavy flows from washing soils away.

4.26. In accordance to best practise guidance rain gardens should be located:

- In full sun or partial shade;
- Within a natural topographic low point in relation to the surrounding area;
- At least 3m (10ft) away from the house, to avoid any damage to foundations by infiltrating water;
- In a well-drained area, on a very gentle incline (10% or less);
- Where it is practical to install a pipe leading to the main drainage system below the rain garden in case of excessively heavy storms.

4.27. In order to provide the maximum amount of storage possible, whilst achieving gravity connection to the proposed pond, the rain gardens will be constructed as flows:

Raingarden 1 (129m^2): Serving plots 1 to 4

- Freeboard of 300mm,
- Topsoil (ratio 50% sand, 30% topsoil and 20% compost) of 300mm
- Sub-base of 500mm.

Raingarden 2 (38m^2): Serving plot 9

- Freeboard of 200mm,
- Topsoil (ratio 50% sand, 30% topsoil and 20% compost) of 300mm
- Sub-base of 300mm.

4.28. An under-drain will be installed within the sub-base of the rain gardens to ensure both drain effectively and prevent waterlogging.

4.29. An 18mm diameter orifice will be installed to control discharge from rain garden 1, serving plots 1 to 4, and reduce flows to less 0.5 litres/second.

4.30. A 21mm diameter orifice will be installed to control discharge from rain garden 2, serving plot 9, and reduce flows to less 0.5 litres/second.

4.31. From both rain gardens, water will be discharged at a controlled rate into the pond (refer to the following section).

4.32. Refer to report appendix for suggested planting and raingarden schematics.

4.33. The highest pollution hazard level for the proposed land use is Very Low (residential roofs). The pollution hazard indices for this land use are shown in Table 1 below.

Total suspended solids (TSS)	Metals	Hydrocarbons
0.2	0.2	0.05

Table 3: Pollution Hazard Indices for the proposed site (from Table 26.2 of CIRIA C753 The SuDS Manual)

4.34. All SuDS components are assessed for their effectiveness in pollutant removal prior to discharge to sewer in Table 26.3 in CIRIA C753 The SuDS Manual. The pollution mitigation indices for raingardens (Bioretention)are show in Table 2 below.

Total suspended solids (TSS)	Metals	Hydrocarbons
0.8	0.8	0.8

Table 4: Pollution Mitigation Indices for raingardens (Bioretention) (from Table 26.3 of CIRIA C753 The SuDS Manual)

4.35. The Pollution Mitigation Indices for the raingardens (Bioretention) are greater than the Pollution Hazard Indices for car parks and low trafficked roads. Therefore, raingardens (Bioretention) will provide sufficient water quality treatment prior to discharge.

Pond (Attenuation Basin):

4.36. Runoff from the proposed roof areas associated with plots 1 to 6, plot 9 and the two car ports will be directed into an attenuation basin Sustainable Urban Drainage System (SUDS) situated in the centre south of the site. The main purpose of the pond will be to attenuate surface water runoff from the southerly most roof areas; however it will also provide ecological and aesthetic benefits.

4.37. Roof runoff from plots 5 and 6 (241m^2) and the two car ports (202m^2) will be connected directly to an attenuation basin located to in the centre south of the development.

4.38. Given that plots 5 and 6 are residential, an urban creep allowance needs to be applied. Plots 5 and 6 comprise some 241m^2 of potentially impermeable surfacing. In order to comply with CIRIA C753 The SuDS Manual, a 10% allowance will be added to take into account future urban creep. Therefore, drainage calculations have been made on the basis of a total contributing impermeable area for plots 5 and 6 of 265.1m^2.

4.39. Runoff from plots 1 to 4 and 9 will be directed towards respective rain gardens prior to discharge to the attenuation basin. Discharge from each of the rain gardens into the pond will be limited to a maximum of 0.5 l/s. Refer to preceding section for information on the proposed raingardens.

4.40. Outflow from the attenuation basin to the drainage ditch will be limited to 0.5 l/s for all storms up to, and including, the 1:100 year + 40% climate change event via a hydrobrake. The hydrobrake will be installed in an inspection chamber within the site.

4.41. Preliminary calculations indicate that an attenuation basin with dimensions of 264.2m^2 x 1.5m deep will be sufficient to accommodate all runoff from 1005m^2 of impermeable surfacing arising from the critical 1:100 year + 40% Climate Change event.

4.42. The pond will provide an attenuation volume of 51.7m^3 for surface water runoff from the development. The maximum attenuated water depth within the pond will be 0.403m.

4.43. The basin will retain a permanent water level at a depth of 0.5m; this can be utilised to provide biodiversity enhancement as part of the development and contribute towards the general amenity value of the scheme. All attenuation required for management of runoff from the catchment draining to the pond will be located above the permanent water volume but below the required 0.5m freeboard.

4.44. The basin design includes 0.597m of freeboard, above the maximum water level. This will mitigate residual flood risk from blockage or exceedance storm events.

4.45. Refer to enclosed MicroDrainage calculations.

4.46. The highest pollution hazard level for the proposed land use is Low (residential car parks and low trafficked roads). The pollution hazard indices for this land use are shown in Table 1 below.

Total suspended solids (TSS)	Metals	Hydrocarbons
0.5	0.4	0.4

Table 5: Pollution Hazard Indices for the proposed site (from Table 26.2 of CIRIA C753 The SuDS Manual)

4.47. All SuDS components are assessed for their effectiveness in pollutant removal prior to discharge to sewer in Table 26.3 in CIRIA C753 The SuDS Manual. The pollution mitigation indices for pond (attenuation basin) are show in Table 2 below.

Total suspended solids (TSS)	Metals	Hydrocarbons
0.7	0.7	0.5

Table 6: Pollution Mitigation Indices for pond (attenuation basin) (from Table 26.3 of CIRIA C753 The SuDS Manual)

4.48. The Pollution Mitigation Indices for pond (attenuation basin) are greater than the Pollution Hazard Indices for car parks and low trafficked roads. Therefore, pond (attenuation basin) will provide sufficient water quality treatment prior to discharge.

Attenuation Storage:

4.49. Surface water runoff from roof areas associated with plots 10 to 24 will be directed to and stored within an attenuation storage tank.

4.50. According to plans made available by the client the total roof area associated with plots 10 to 24 amounts to some 1066m^2 of potentially impermeable surfacing.

4.51. In order to comply with CIRIA C753 The SuDS Manual, a 10% allowance will need to be added to the roof areas to account future urban creep in this area. Applying a 10% allowance to the roof areas (1066m^2) gives a value of 1172.6m^2. In light of this, all drainage calculations for the attenuation storage tank have been made on the basis of an impermeable coverage of 1172.6m^2.

4.52. From the attenuation storage tank, runoff will be gradually discharged to the drainage ditch some 35m north of the site, via the existing surface water infrastructure.

4.53. Outflow from the attenuation tank to the drainage ditch will be limited to a maximum of 0.6 l/s for all storms up to, and including, the 1:100 year + 40% climate change event via a hydrobrake. The hydrobrake will be installed in an inspection chamber within the site.

4.54. Preliminary calculations indicate that sufficient storage required to attenuate runoff from the proposed impermeable areas (1172.6m^2) associated with plots 10 to 24, arising from the critical 1:100 year + 40% climate change event, can be provided within an attenuation storage tank of dimensions 120.0m^2 x 1.0m deep.

4.55. Preliminary calculations indicated that some 92.5m^3 of storage is required to attenuate the runoff for all storms up to and including the 1:100 year + 40% climate change event.

4.56. Refer to enclosed MicroDrainage calculations.

4.57. Runoff from roof areas is considered to be uncontaminated and does not warrant any form of treatment process to improve water quality. Nevertheless, it is suggested to include debris / sediment traps on any new drainage.

Water Quality:

4.58. In addition to the water quality improvements stated in the previous sections, there will be an oil interceptor located upstream of the outfall to the watercourse. This will further reduce the pollution before the water leaves the site.

5. Discussion and Conclusions:

5.1. This Technical Note has been prepared by Unda Consulting Limited on behalf of Aitco Ltd, to address the concerns of Matthew Taylor of Wealden District Council.

5.2. The site is occupied by a former mill and is approximately 14631m2 in size.

5.3. A measured topographical survey has been undertaken at the site and provided by the client for inclusion within the report. This indicates that levels on site range between 4.71mAOD in the north and 10.79mAOD in the south west.

5.4. Based on the plans provided, the twenty four residential dwellings are proposed to be development upon land with an approximate elevation of between 4.82mAOD and 8.54mAOD.

5.5. The proposed planning application is for redevelopment of the site with construction of twenty four new residential dwellings, with associated access road and parking.

5.6. Attenuation sizing within the strategy has been based on all newly introduced impermeable surfacing (6441m^2), comprising both post development roof area and hardstanding. Thus significant betterment will be provided post development.

Surface Water Drainage Strategy Discussion

5.7. Test results provided by Southern Testing Ltd indicate that all four Trial Pits failed to drain thus failed to complete the necessary drop in level (25% full) to calculate a compliant value for infiltration.

5.8. Utilising the northern connection for post development runoff also corresponds with East Sussex County Council's consultation comments, dated 13th October 2017, which state:

Our preference is for the northern outfall to be used as this involves a short section of sewer and then discharges directly to the watercourse, unless the eastern outfall is proven to have significant benefits. We would request that each of the outfalls is investigated and the most appropriate outfall selected prior to the layout being fixed through any Reserved Matters application. This will also depend on the topography of the site.

5.9. Existing greenfield runoff rates for the site have been calculated as 6.4 l/s for the 1:1 annual runoff event, 17.0 l/s for the 1:30 year event and 24.0 l/s for the 1:100 year event. Refer to calculations in appendix.

5.10. Outflow from the site will be limited by three hydro-brake flow control devices to a combined maximum rate of 3.2 l/s.

5.11. Below is a summary of the proposed mechanisms of surface water drainage at the site for each element of the scheme.

Element	Raingarden	Pond	Tanked Permeable Paving	Attenuation Storage Tank
Road, Paving and Parking				
Roof Area: Plots 1 – 4				
Roof Area: Plots 5 - 6				
Roof Area: Plots 7 – 8				
Roof Area: Plot 9				
Roof Area: Plots 10 – 24				
Car Ports				

5.12. Refer to pages 5-9 for further information regarding the individual SuDS sizing and how each feature will reduce contaminants.

5.13. In addition to the water quality improvements stated in the previous sections, there will be an oil interceptor located upstream of the outfall to the watercourse. This will further reduce the pollution before the water leaves the site to form a two-stage filtration system.

5.14. The roof runoff from plots 10 to 24 which is considered uncontaminated has a single stage filtration as there is not room within the scheme for a second stage.

5.15. This drainage strategy has been undertaken in accordance with the principles set out in NPPF. We can conclude that providing the development adheres to the conditions advised above, the said development proposals can be accommodated without increasing flood risk within the locality in accordance with objectives set by Central Government and the EA.

Unda Consulting Limited

January 2021

6. Appendix

MicroDrainage Calculations:

- ICP SUDS Rural Runoff Calculations;
- ICP SUDS Urban Runoff Calculations;
- Tanked Permeable Paving and Hydro-Brake Calculations;
- Rain Garden Cascade;
- Pond Sizing and Hydro-Brake Calculations;
- Attenuation Storage and Hydro-Brake Calculations.

Information by Others:

- Infiltration Test Results – Southern Testing Ltd.

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	1.463	Urban	0.000
SAAR (mm)	800	Region Number	Region 7

Results l/s

QBAR Rural	7.5
QBAR Urban	7.5
Q100 years	24.0
Q1 year	6.4
Q30 years	17.0
Q100 years	24.0

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	1.463	Urban	0.370
SAAR (mm)	800	Region Number	Region 7

Results l/s

QBAR Rural	7.5
QBAR Urban	12.7
Q100 years	31.3
Q1 year	10.8
Q30 years	24.9
Q100 years	31.3

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 1383 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	4.626	0.146	0.0	2.1	2.1	102.6	O K
30 min Summer	4.680	0.200	0.0	2.1	2.1	140.4	O K
60 min Summer	4.737	0.257	0.0	2.1	2.1	180.2	Flood Risk
120 min Summer	4.793	0.313	0.0	2.1	2.1	219.7	Flood Risk
180 min Summer	4.823	0.343	0.0	2.1	2.1	241.0	Flood Risk
240 min Summer	4.843	0.363	0.0	2.1	2.1	255.1	Flood Risk
360 min Summer	4.870	0.390	0.0	2.1	2.1	273.9	Flood Risk
480 min Summer	4.886	0.406	0.0	2.1	2.1	285.1	Flood Risk
600 min Summer	4.896	0.416	0.0	2.1	2.1	292.0	Flood Risk
720 min Summer	4.901	0.421	0.0	2.1	2.1	296.0	Flood Risk
960 min Summer	4.905	0.425	0.0	2.1	2.1	298.7	Flood Risk
1440 min Summer	4.900	0.420	0.0	2.1	2.1	295.1	Flood Risk
2160 min Summer	4.887	0.407	0.0	2.1	2.1	285.9	Flood Risk
2880 min Summer	4.871	0.391	0.0	2.1	2.1	274.5	Flood Risk
4320 min Summer	4.833	0.353	0.0	2.1	2.1	247.9	Flood Risk
5760 min Summer	4.790	0.310	0.0	2.1	2.1	217.9	Flood Risk
7200 min Summer	4.753	0.273	0.0	2.1	2.1	191.5	Flood Risk
8640 min Summer	4.719	0.239	0.0	2.1	2.1	168.0	Flood Risk
10080 min Summer	4.689	0.209	0.0	2.1	2.1	147.1	Flood Risk
15 min Winter	4.646	0.166	0.0	2.1	2.1	116.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.005	0.0	89.5	19
30 min Summer	92.274	0.0	123.6	34
60 min Summer	58.745	0.0	176.2	64
120 min Summer	36.008	0.0	218.2	124
180 min Summer	26.598	0.0	241.9	184
240 min Summer	21.360	0.0	258.4	242
360 min Summer	15.683	0.0	282.0	362
480 min Summer	12.575	0.0	297.3	482
600 min Summer	10.586	0.0	306.6	602
720 min Summer	9.192	0.0	310.7	722
960 min Summer	7.349	0.0	306.7	960
1440 min Summer	5.351	0.0	287.8	1226
2160 min Summer	3.888	0.0	438.3	1600
2880 min Summer	3.096	0.0	461.1	2016
4320 min Summer	2.242	0.0	486.7	2852
5760 min Summer	1.781	0.0	530.4	3624
7200 min Summer	1.491	0.0	549.5	4392
8640 min Summer	1.289	0.0	564.1	5104
10080 min Summer	1.141	0.0	574.5	5848
15 min Winter	138.005	0.0	102.0	19

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	4.706	0.226	0.0	2.1	2.1	158.9	Flood Risk
60 min Winter	4.770	0.290	0.0	2.1	2.1	203.6	Flood Risk
120 min Winter	4.834	0.354	0.0	2.1	2.1	248.6	Flood Risk
180 min Winter	4.868	0.388	0.0	2.1	2.1	272.7	Flood Risk
240 min Winter	4.891	0.411	0.0	2.1	2.1	288.5	Flood Risk
360 min Winter	4.921	0.441	0.0	2.1	2.1	310.0	Flood Risk
480 min Winter	4.940	0.460	0.0	2.1	2.1	323.2	Flood Risk
600 min Winter	4.952	0.472	0.0	2.1	2.1	331.7	Flood Risk
720 min Winter	4.960	0.480	0.0	2.1	2.1	337.1	Flood Risk
960 min Winter	4.967	0.487	0.0	2.1	2.1	342.0	Flood Risk
1440 min Winter	4.962	0.482	0.0	2.1	2.1	339.0	Flood Risk
2160 min Winter	4.943	0.463	0.0	2.1	2.1	325.5	Flood Risk
2880 min Winter	4.921	0.441	0.0	2.1	2.1	309.9	Flood Risk
4320 min Winter	4.868	0.388	0.0	2.1	2.1	272.5	Flood Risk
5760 min Winter	4.805	0.325	0.0	2.1	2.1	228.3	Flood Risk
7200 min Winter	4.746	0.266	0.0	2.1	2.1	186.6	Flood Risk
8640 min Winter	4.695	0.215	0.0	2.1	2.1	151.0	Flood Risk
10080 min Winter	4.652	0.172	0.0	2.1	2.1	121.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	92.274	0.0	138.7	33
60 min Winter	58.745	0.0	198.8	64
120 min Winter	36.008	0.0	245.0	122
180 min Winter	26.598	0.0	270.5	180
240 min Winter	21.360	0.0	287.8	240
360 min Winter	15.683	0.0	310.5	356
480 min Winter	12.575	0.0	321.1	472
600 min Winter	10.586	0.0	322.7	588
720 min Winter	9.192	0.0	319.4	702
960 min Winter	7.349	0.0	311.4	926
1440 min Winter	5.351	0.0	295.8	1354
2160 min Winter	3.888	0.0	492.7	1688
2880 min Winter	3.096	0.0	517.5	2160
4320 min Winter	2.242	0.0	534.9	3072
5760 min Winter	1.781	0.0	599.1	3928
7200 min Winter	1.491	0.0	621.6	4680
8640 min Winter	1.289	0.0	639.3	5368
10080 min Winter	1.141	0.0	652.4	6056

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.700	Shortest Storm (mins)	15
Ratio R	0.358	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.447

Time (mins) From:	To:	Area (ha)
0	4	0.447

Model Details

Storage is Online Cover Level (m) 4.980

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	234.2
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	650.6	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	4.480	Cap Volume Depth (m)	0.500

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0076-2100-0500-2100
Design Head (m)	0.500
Design Flow (l/s)	2.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	76
Invert Level (m)	4.480
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	2.1
Flush-Flo™	0.149	2.1
Kick-Flo®	0.345	1.8
Mean Flow over Head Range	-	1.8

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.0	1.200	3.1	3.000	4.8	7.000	7.2
0.200	2.1	1.400	3.4	3.500	5.2	7.500	7.4
0.300	2.0	1.600	3.6	4.000	5.5	8.000	7.7
0.400	1.9	1.800	3.8	4.500	5.8	8.500	7.9
0.500	2.1	2.000	4.0	5.000	6.1	9.000	8.2
0.600	2.3	2.200	4.1	5.500	6.4	9.500	8.4
0.800	2.6	2.400	4.3	6.000	6.7		
1.000	2.9	2.600	4.5	6.500	6.9		

Cascade Summary of Results for Plots 1 to 4 Raingarden 0.5 ls.SRCX

Upstream Structures	Outflow To	Overflow To
(None)	Plots 5 to 6 and car port Direct to Pond.SRCX	(None)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	7.635	0.075	0.2	9.7	O K
30 min Summer	7.660	0.100	0.2	12.9	O K
60 min Summer	7.686	0.126	0.2	16.2	O K
120 min Summer	7.711	0.151	0.3	19.4	Flood Risk
180 min Summer	7.723	0.163	0.3	21.0	Flood Risk
240 min Summer	7.731	0.171	0.3	22.0	Flood Risk
360 min Summer	7.740	0.180	0.3	23.2	Flood Risk
480 min Summer	7.744	0.184	0.3	23.7	Flood Risk
600 min Summer	7.745	0.185	0.3	23.9	Flood Risk
720 min Summer	7.746	0.186	0.3	24.0	Flood Risk
960 min Summer	7.746	0.186	0.3	24.0	Flood Risk
1440 min Summer	7.744	0.184	0.3	23.8	Flood Risk
2160 min Summer	7.737	0.177	0.3	22.9	Flood Risk
2880 min Summer	7.729	0.169	0.3	21.8	Flood Risk
4320 min Summer	7.712	0.152	0.3	19.7	Flood Risk
5760 min Summer	7.697	0.137	0.2	17.7	O K
7200 min Summer	7.685	0.125	0.2	16.1	O K
8640 min Summer	7.674	0.114	0.2	14.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.005	0.0	8.3	19
30 min Summer	92.274	0.0	11.0	34
60 min Summer	58.745	0.0	16.0	64
120 min Summer	36.008	0.0	19.6	122
180 min Summer	26.598	0.0	21.7	182
240 min Summer	21.360	0.0	23.2	242
360 min Summer	15.683	0.0	25.5	362
480 min Summer	12.575	0.0	27.1	480
600 min Summer	10.586	0.0	28.3	582
720 min Summer	9.192	0.0	29.3	624
960 min Summer	7.349	0.0	30.7	748
1440 min Summer	5.351	0.0	31.8	1010
2160 min Summer	3.888	0.0	39.3	1424
2880 min Summer	3.096	0.0	41.7	1820
4320 min Summer	2.242	0.0	44.7	2636
5760 min Summer	1.781	0.0	48.5	3408
7200 min Summer	1.491	0.0	50.7	4184
8640 min Summer	1.289	0.0	52.5	4928

Cascade Summary of Results for Plots 1 to 4 Raingarden 0.5 ls.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	7.664	0.104	0.2	13.5	O K
15 min Winter	7.644	0.084	0.2	10.9	O K
30 min Winter	7.672	0.112	0.2	14.5	O K
60 min Winter	7.701	0.141	0.2	18.2	O K
120 min Winter	7.729	0.169	0.3	21.8	Flood Risk
180 min Winter	7.744	0.184	0.3	23.7	Flood Risk
240 min Winter	7.752	0.192	0.3	24.8	Flood Risk
360 min Winter	7.763	0.203	0.3	26.2	Flood Risk
480 min Winter	7.769	0.209	0.3	26.9	Flood Risk
600 min Winter	7.771	0.211	0.3	27.2	Flood Risk
720 min Winter	7.772	0.212	0.3	27.3	Flood Risk
960 min Winter	7.771	0.211	0.3	27.2	Flood Risk
1440 min Winter	7.767	0.207	0.3	26.7	Flood Risk
2160 min Winter	7.756	0.196	0.3	25.3	Flood Risk
2880 min Winter	7.743	0.183	0.3	23.7	Flood Risk
4320 min Winter	7.719	0.159	0.3	20.5	Flood Risk
5760 min Winter	7.698	0.138	0.2	17.8	O K
7200 min Winter	7.681	0.121	0.2	15.6	O K
8640 min Winter	7.666	0.106	0.2	13.7	O K
10080 min Winter	7.655	0.095	0.2	12.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.141	0.0	54.0	5656
15 min Winter	138.005	0.0	9.3	19
30 min Winter	92.274	0.0	12.2	33
60 min Winter	58.745	0.0	17.9	62
120 min Winter	36.008	0.0	21.9	122
180 min Winter	26.598	0.0	24.3	180
240 min Winter	21.360	0.0	25.9	238
360 min Winter	15.683	0.0	28.4	352
480 min Winter	12.575	0.0	30.2	466
600 min Winter	10.586	0.0	31.5	574
720 min Winter	9.192	0.0	32.5	680
960 min Winter	7.349	0.0	33.8	780
1440 min Winter	5.351	0.0	34.7	1082
2160 min Winter	3.888	0.0	44.1	1536
2880 min Winter	3.096	0.0	46.7	1984
4320 min Winter	2.242	0.0	50.0	2812
5760 min Winter	1.781	0.0	54.3	3632
7200 min Winter	1.491	0.0	56.8	4400
8640 min Winter	1.289	0.0	58.9	5184
10080 min Winter	1.141	0.0	60.6	5944

Cascade Rainfall Details for Plots 1 to 4 Raingarden 0.5 ls.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.700	Shortest Storm (mins)	15
Ratio R	0.358	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.038

Time (mins) From:	To:	Area (ha)
0	4	0.038

Cascade Model Details for Plots 1 to 4 Raingarden 0.5 ls.SRCX

Storage is Online Cover Level (m) 8.010

Tank or Pond Structure

Invert Level (m) 7.560

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	129.0	0.450	129.0

Orifice Outflow Control

Diameter (m) 0.018 Discharge Coefficient 0.600 Invert Level (m) 7.560

Cascade Summary of Results for Plot 9 Raingarden 0.5 ls.SRCX

Upstream Structures	Outflow To	Overflow To
(None)	Plots 5 to 6 and car port Direct to Pond.SRCX	(None)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	7.504	0.104	0.3	4.0	Flood Risk
30 min Summer	7.536	0.136	0.3	5.2	Flood Risk
60 min Summer	7.565	0.165	0.4	6.3	Flood Risk
120 min Summer	7.583	0.183	0.4	7.0	Flood Risk
180 min Summer	7.587	0.187	0.4	7.1	Flood Risk
240 min Summer	7.588	0.188	0.4	7.1	Flood Risk
360 min Summer	7.587	0.187	0.4	7.1	Flood Risk
480 min Summer	7.583	0.183	0.4	6.9	Flood Risk
600 min Summer	7.577	0.177	0.4	6.7	Flood Risk
720 min Summer	7.571	0.171	0.4	6.5	Flood Risk
960 min Summer	7.559	0.159	0.4	6.1	Flood Risk
1440 min Summer	7.538	0.138	0.3	5.2	Flood Risk
2160 min Summer	7.513	0.113	0.3	4.3	Flood Risk
2880 min Summer	7.495	0.095	0.3	3.6	Flood Risk
4320 min Summer	7.471	0.071	0.2	2.7	Flood Risk
5760 min Summer	7.455	0.055	0.2	2.1	Flood Risk
7200 min Summer	7.446	0.046	0.2	1.7	Flood Risk
8640 min Summer	7.439	0.039	0.2	1.5	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.005	0.0	4.1	18
30 min Summer	92.274	0.0	5.4	33
60 min Summer	58.745	0.0	7.0	62
120 min Summer	36.008	0.0	8.6	120
180 min Summer	26.598	0.0	9.5	150
240 min Summer	21.360	0.0	10.2	180
360 min Summer	15.683	0.0	11.2	248
480 min Summer	12.575	0.0	12.0	316
600 min Summer	10.586	0.0	12.7	386
720 min Summer	9.192	0.0	13.2	454
960 min Summer	7.349	0.0	14.1	588
1440 min Summer	5.351	0.0	15.3	850
2160 min Summer	3.888	0.0	16.8	1228
2880 min Summer	3.096	0.0	17.8	1588
4320 min Summer	2.242	0.0	19.3	2296
5760 min Summer	1.781	0.0	20.5	3008
7200 min Summer	1.491	0.0	21.4	3744
8640 min Summer	1.289	0.0	22.2	4416

Cascade Summary of Results for Plot 9 Raingarden 0.5 ls.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	7.434	0.034	0.1	1.3	Flood Risk
15 min Winter	7.517	0.117	0.3	4.5	Flood Risk
30 min Winter	7.553	0.153	0.3	5.8	Flood Risk
60 min Winter	7.586	0.186	0.4	7.1	Flood Risk
120 min Winter	7.609	0.209	0.4	7.9	Flood Risk
180 min Winter	7.612	0.212	0.4	8.1	Flood Risk
240 min Winter	7.612	0.212	0.4	8.1	Flood Risk
360 min Winter	7.609	0.209	0.4	7.9	Flood Risk
480 min Winter	7.601	0.201	0.4	7.7	Flood Risk
600 min Winter	7.593	0.193	0.4	7.3	Flood Risk
720 min Winter	7.584	0.184	0.4	7.0	Flood Risk
960 min Winter	7.566	0.166	0.4	6.3	Flood Risk
1440 min Winter	7.536	0.136	0.3	5.2	Flood Risk
2160 min Winter	7.503	0.103	0.3	3.9	Flood Risk
2880 min Winter	7.481	0.081	0.2	3.1	Flood Risk
4320 min Winter	7.455	0.055	0.2	2.1	Flood Risk
5760 min Winter	7.441	0.041	0.2	1.6	Flood Risk
7200 min Winter	7.433	0.033	0.1	1.2	Flood Risk
8640 min Winter	7.429	0.029	0.1	1.1	Flood Risk
10080 min Winter	7.426	0.026	0.1	1.0	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.141	0.0	22.9	5144
15 min Winter	138.005	0.0	4.5	18
30 min Winter	92.274	0.0	6.1	32
60 min Winter	58.745	0.0	7.9	60
120 min Winter	36.008	0.0	9.6	116
180 min Winter	26.598	0.0	10.7	168
240 min Winter	21.360	0.0	11.4	190
360 min Winter	15.683	0.0	12.6	266
480 min Winter	12.575	0.0	13.5	342
600 min Winter	10.586	0.0	14.2	416
720 min Winter	9.192	0.0	14.8	488
960 min Winter	7.349	0.0	15.7	626
1440 min Winter	5.351	0.0	17.2	894
2160 min Winter	3.888	0.0	18.8	1276
2880 min Winter	3.096	0.0	19.9	1644
4320 min Winter	2.242	0.0	21.6	2336
5760 min Winter	1.781	0.0	23.0	3056
7200 min Winter	1.491	0.0	24.0	3752
8640 min Winter	1.289	0.0	24.9	4408
10080 min Winter	1.141	0.0	25.7	5152

Cascade Rainfall Details for Plot 9 Raingarden 0.5 ls.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.700	Shortest Storm (mins)	15
Ratio R	0.358	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.016

Time (mins) From:	To:	Area (ha)
0	4	0.016

Cascade Model Details for Plot 9 Raingarden 0.5 ls.SRCX

Storage is Online Cover Level (m) 7.690

Tank or Pond Structure

Invert Level (m) 7.400

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	38.0	0.290	38.0

Orifice Outflow Control

Diameter (m) 0.021 Discharge Coefficient 0.600 Invert Level (m) 7.400

Cascade Summary of Results for Plots 5 to 6 and car port Direct to Pond.SRCX

Upstream Structures	Outflow To	Overflow To
Plot 9 Raingarden 0.5 ls.SRCX	(None)	(None)
Plots 1 to 4 Raingarden 0.5 ls.SRCX		

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	6.849	0.109	0.5	12.1	O K
30 min Summer	6.884	0.144	0.5	16.3	O K
60 min Summer	6.923	0.183	0.5	21.1	O K
120 min Summer	6.965	0.225	0.5	26.5	Flood Risk
180 min Summer	6.989	0.249	0.5	29.6	Flood Risk
240 min Summer	7.006	0.266	0.5	31.9	Flood Risk
360 min Summer	7.031	0.291	0.5	35.4	Flood Risk
480 min Summer	7.049	0.309	0.5	37.9	Flood Risk
600 min Summer	7.062	0.322	0.5	39.8	Flood Risk
720 min Summer	7.073	0.333	0.5	41.3	Flood Risk
960 min Summer	7.085	0.345	0.5	43.2	Flood Risk
1440 min Summer	7.096	0.356	0.5	44.7	Flood Risk
2160 min Summer	7.084	0.344	0.5	43.0	Flood Risk
2880 min Summer	7.065	0.325	0.5	40.2	Flood Risk
4320 min Summer	7.027	0.287	0.5	34.9	Flood Risk
5760 min Summer	6.994	0.254	0.5	30.3	Flood Risk
7200 min Summer	6.963	0.223	0.5	26.2	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.005	0.0	23.2	19
30 min Summer	92.274	0.0	31.0	78
60 min Summer	58.745	0.0	43.0	188
120 min Summer	36.008	0.0	52.7	312
180 min Summer	26.598	0.0	58.4	394
240 min Summer	21.360	0.0	62.5	464
360 min Summer	15.683	0.0	68.5	586
480 min Summer	12.575	0.0	72.7	696
600 min Summer	10.586	0.0	75.2	802
720 min Summer	9.192	0.0	75.5	898
960 min Summer	7.349	0.0	73.8	1052
1440 min Summer	5.351	0.0	69.6	1442
2160 min Summer	3.888	0.0	104.9	2088
2880 min Summer	3.096	0.0	111.2	2388
4320 min Summer	2.242	0.0	119.7	2988
5760 min Summer	1.781	0.0	129.0	3728
7200 min Summer	1.491	0.0	134.9	4472

Cascade Summary of Results for Plots 5 to 6 and car port Direct to Pond.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Summer	6.934	0.194	0.5	22.5	O K
10080 min Summer	6.908	0.168	0.5	19.2	O K
15 min Winter	6.862	0.122	0.5	13.6	O K
30 min Winter	6.901	0.161	0.5	18.4	O K
60 min Winter	6.946	0.206	0.5	24.0	Flood Risk
120 min Winter	6.994	0.254	0.5	30.3	Flood Risk
180 min Winter	7.021	0.281	0.5	34.1	Flood Risk
240 min Winter	7.042	0.302	0.5	36.9	Flood Risk
360 min Winter	7.073	0.333	0.5	41.3	Flood Risk
480 min Winter	7.092	0.352	0.5	44.1	Flood Risk
600 min Winter	7.105	0.365	0.5	46.0	Flood Risk
720 min Winter	7.115	0.375	0.5	47.5	Flood Risk
960 min Winter	7.129	0.389	0.5	49.6	Flood Risk
1440 min Winter	7.143	0.403	0.5	51.7	Flood Risk
2160 min Winter	7.136	0.396	0.5	50.7	Flood Risk
2880 min Winter	7.117	0.377	0.5	47.8	Flood Risk
4320 min Winter	7.069	0.329	0.5	40.7	Flood Risk
5760 min Winter	7.011	0.271	0.5	32.6	Flood Risk
7200 min Winter	6.961	0.221	0.5	25.9	Flood Risk
8640 min Winter	6.916	0.176	0.5	20.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.289	0.0	139.9	5192
10080 min Summer	1.141	0.0	143.9	5896
15 min Winter	138.005	0.0	26.0	19
30 min Winter	92.274	0.0	34.4	121
60 min Winter	58.745	0.0	48.2	240
120 min Winter	36.008	0.0	59.1	376
180 min Winter	26.598	0.0	65.3	470
240 min Winter	21.360	0.0	69.7	550
360 min Winter	15.683	0.0	75.4	700
480 min Winter	12.575	0.0	76.6	780
600 min Winter	10.586	0.0	75.8	856
720 min Winter	9.192	0.0	74.8	934
960 min Winter	7.349	0.0	73.0	1084
1440 min Winter	5.351	0.0	69.9	1430
2160 min Winter	3.888	0.0	117.5	2080
2880 min Winter	3.096	0.0	124.4	2676
4320 min Winter	2.242	0.0	131.7	3372
5760 min Winter	1.781	0.0	144.6	4048
7200 min Winter	1.491	0.0	151.2	4784
8640 min Winter	1.289	0.0	156.8	5464

Cascade Summary of Results for Plots 5 to 6 and car port Direct to Pond.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Winter	6.879	0.139	0.5	15.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	1.141	0.0	161.4	6152

Cascade Rainfall Details for Plots 5 to 6 and car port Direct to Pond.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.700	Shortest Storm (mins)	15
Ratio R	0.358	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.047

Time (mins) From:	To:	Area (ha)
0	4	0.047

Cascade Model Details for Plots 5 to 6 and car port Direct to Pond.SRCX

Storage is Online Cover Level (m) 7.240

Tank or Pond Structure

Invert Level (m) 6.740

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	105.0	0.500	166.6	0.501	185.0	1.000	264.2

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0038-5000-0500-5000
Design Head (m)	0.500
Design Flow (l/s)	0.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	38
Invert Level (m)	6.740
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	0.5
Flush-Flo™	0.164	0.5
Kick-Flo®	0.331	0.4
Mean Flow over Head Range	-	0.4

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.5	1.200	0.7	3.000	1.1	7.000	1.6
0.200	0.5	1.400	0.8	3.500	1.2	7.500	1.7
0.300	0.5	1.600	0.8	4.000	1.3	8.000	1.8
0.400	0.5	1.800	0.9	4.500	1.3	8.500	1.8
0.500	0.5	2.000	0.9	5.000	1.4	9.000	1.9
0.600	0.5	2.200	1.0	5.500	1.5	9.500	1.9
0.800	0.6	2.400	1.0	6.000	1.5		
1.000	0.7	2.600	1.0	6.500	1.6		

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	4.360	0.250	0.4	29.9	O K
30 min Summer	4.442	0.332	0.4	39.9	O K
60 min Summer	4.529	0.419	0.4	50.3	O K
120 min Summer	4.615	0.505	0.4	60.6	O K
180 min Summer	4.661	0.551	0.5	66.1	O K
240 min Summer	4.690	0.580	0.5	69.6	O K
360 min Summer	4.730	0.620	0.5	74.3	O K
480 min Summer	4.753	0.643	0.5	77.1	O K
600 min Summer	4.767	0.657	0.5	78.8	O K
720 min Summer	4.775	0.665	0.5	79.8	O K
960 min Summer	4.780	0.670	0.5	80.4	O K
1440 min Summer	4.769	0.659	0.5	79.1	O K
2160 min Summer	4.746	0.636	0.5	76.3	O K
2880 min Summer	4.721	0.611	0.5	73.3	O K
4320 min Summer	4.673	0.563	0.5	67.6	O K
5760 min Summer	4.628	0.518	0.5	62.2	O K
7200 min Summer	4.587	0.477	0.4	57.2	O K
8640 min Summer	4.548	0.438	0.4	52.6	O K
10080 min Summer	4.512	0.402	0.4	48.2	O K
15 min Winter	4.390	0.280	0.4	33.6	O K
30 min Winter	4.483	0.373	0.4	44.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.005	0.0	28.7	19
30 min Summer	92.274	0.0	35.1	34
60 min Summer	58.745	0.0	50.8	64
120 min Summer	36.008	0.0	61.8	124
180 min Summer	26.598	0.0	67.6	184
240 min Summer	21.360	0.0	70.6	242
360 min Summer	15.683	0.0	72.2	362
480 min Summer	12.575	0.0	72.5	482
600 min Summer	10.586	0.0	72.5	602
720 min Summer	9.192	0.0	72.4	722
960 min Summer	7.349	0.0	72.2	960
1440 min Summer	5.351	0.0	72.0	1256
2160 min Summer	3.888	0.0	122.0	1640
2880 min Summer	3.096	0.0	128.9	2020
4320 min Summer	2.242	0.0	126.0	2856
5760 min Summer	1.781	0.0	149.8	3688
7200 min Summer	1.491	0.0	156.8	4536
8640 min Summer	1.289	0.0	162.7	5352
10080 min Summer	1.141	0.0	167.8	6152
15 min Winter	138.005	0.0	31.7	19
30 min Winter	92.274	0.0	35.3	34

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	4.581	0.471	0.4	56.5	O K
120 min Winter	4.678	0.568	0.5	68.1	O K
180 min Winter	4.730	0.620	0.5	74.4	O K
240 min Winter	4.764	0.654	0.5	78.5	O K
360 min Winter	4.811	0.701	0.5	84.1	Flood Risk
480 min Winter	4.839	0.729	0.5	87.5	Flood Risk
600 min Winter	4.858	0.748	0.5	89.7	Flood Risk
720 min Winter	4.870	0.760	0.5	91.2	Flood Risk
960 min Winter	4.881	0.771	0.5	92.5	Flood Risk
1440 min Winter	4.875	0.765	0.5	91.8	Flood Risk
2160 min Winter	4.845	0.735	0.5	88.2	Flood Risk
2880 min Winter	4.814	0.704	0.5	84.5	Flood Risk
4320 min Winter	4.746	0.636	0.5	76.3	O K
5760 min Winter	4.680	0.570	0.5	68.4	O K
7200 min Winter	4.619	0.509	0.4	61.0	O K
8640 min Winter	4.561	0.451	0.4	54.1	O K
10080 min Winter	4.506	0.396	0.4	47.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	58.745	0.0	56.7	64
120 min Winter	36.008	0.0	68.3	122
180 min Winter	26.598	0.0	72.2	180
240 min Winter	21.360	0.0	73.2	240
360 min Winter	15.683	0.0	73.9	356
480 min Winter	12.575	0.0	74.4	474
600 min Winter	10.586	0.0	74.7	590
720 min Winter	9.192	0.0	75.1	702
960 min Winter	7.349	0.0	75.9	930
1440 min Winter	5.351	0.0	76.2	1358
2160 min Winter	3.888	0.0	136.2	1712
2880 min Winter	3.096	0.0	141.3	2164
4320 min Winter	2.242	0.0	132.5	3108
5760 min Winter	1.781	0.0	167.8	3984
7200 min Winter	1.491	0.0	175.6	4896
8640 min Winter	1.289	0.0	182.2	5712
10080 min Winter	1.141	0.0	187.9	6648

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.700	Shortest Storm (mins)	15
Ratio R	0.358	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.117

Time (mins) From:	To:	Area (ha)
0	4	0.117

Model Details

Storage is Online Cover Level (m) 5.110

Tank or Pond Structure

Invert Level (m) 4.110

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	120.0	1.000	120.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0036-6000-1000-6000
Design Head (m)	1.000
Design Flow (l/s)	0.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	36
Invert Level (m)	4.110
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	0.6
Flush-Flo™	0.156	0.4
Kick-Flo®	0.317	0.4
Mean Flow over Head Range	-	0.5

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.4	1.200	0.6	3.000	1.0	7.000	1.4
0.200	0.4	1.400	0.7	3.500	1.0	7.500	1.5
0.300	0.4	1.600	0.7	4.000	1.1	8.000	1.5
0.400	0.4	1.800	0.8	4.500	1.2	8.500	1.6
0.500	0.4	2.000	0.8	5.000	1.2	9.000	1.6
0.600	0.5	2.200	0.9	5.500	1.3	9.500	1.7
0.800	0.5	2.400	0.9	6.000	1.3		
1.000	0.6	2.600	0.9	6.500	1.4		

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Factual Soakage Test Report

Project Name: Old Loom Mill, Hailsham

Location: Ersham Road, Hailsham, East Sussex

Client: Aitco Ltd.

Project ID: J14496

Report Date: 8 July 2020

Report Issue: 1

Author	C Lennard BEng (Hons)	
Check / Review	J N Race BSc MSc CGeol FGS	

For and on behalf of Southern Testing Laboratories Limited

DOCUMENT HISTORY AND STATUS

Issue No.	Date	Purpose or Status	Author	Check / Review
1	08/07/2020	First Issue	CL	JNR

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A INTRODUCTION

1 Authority

Our authority for carrying out this work is contained in a Southern Testing Project Order form (dated 18 June 2020) completed by Mr C Frost of Future Planning and Development Ltd. On behalf of Aitco Ltd.

2 Location

The site is located approximately 2km to the south of Hailsham town centre. The National Grid Reference of the site is TQ 58820 07250. The site location is indicated on Figure 1 within Appendix A.

3 Background & Objectives

It is proposed to redevelop the site with residential properties, which includes areas of proposed attenuation ponds/swales. The object of this investigation was to assess the soakage potential of soils on site.

4 Scope

This factual report presents our exploratory hole logs and test results only. Contamination and geotechnical issues are not considered in this report.

A UXO risk assessment was not requested within our brief for the investigation.

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

This report is not an engineering design and the figures and calculations contained in the report should be used by the Engineer, taking note that variations will apply, according to variations in design loading, in techniques used, and in site conditions. Our figures therefore should not supersede the Engineer's design.

The site investigation has been completed with reference to BS 5930 [1] and BS 10175 [2].

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

The investigation was conducted and this report has been prepared for the sole internal use and reliance of Aitco Ltd. and their appointed Engineers. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Southern Testing Laboratories Ltd. If an unauthorised third party comes into possession of this report they rely on it at their peril and the authors owe them no duty of care and skill.

The recommendations contained in this report may not be appropriate to alternative development schemes.

B SITE SETTING

5 Geology

The British Geological Survey 1:50,000 map of the area (No. 319/334 – Lewes & Eastbourne) indicates that the site geology consists of the Weald Clay Formation.

5.1.1 Weald Clay Formation

The Weald Clay Formation comprises dark grey thinly-bedded shales and mudstones with subordinate siltstones, sandstones (including the Horsham Stone Member), shelly limestones and clay ironstones. The mudstones weather to yellow and brown clays. Conspicuous bands of red clay also occur, usually in close association with sandstone beds.

The clays have often been worked for various purposes, and the clay ironstone, a low-grade iron ore, was worked from sporadic beds across the Wealden area. The steep sides of the degraded remains of former workings are usually unstable. Other workings have been filled with a variety of materials.

This formation is known to contain pyrite.

6 Site Description

The subject site, which is approximately rectangular in shape and extends to around 145×95m, comprises a vacant mill, together with numerous outbuildings. The site is understood to have most recently been used for a number of commercial/retail purposes including a tearoom, fabric shop and craft units.

Approximately half of the site is covered by buildings, some of which were noted to have corrugated asbestos cement roofs, and hardstanding areas, which include concrete and compacted granular material. The remainder of the site comprises grassed areas, overgrown shrubs/bushes and numerous semi-mature to mature trees.

Access was not available within the buildings, however, some areas of rubbish/fly-tipped materials were observed within some external hardstanding areas, most notably in the centre/west of the site.

The site is set within a predominantly rural area, which comprises fields and scattered residential/commercial properties, together with the Cuckoo Trail (a former railway line) forming the western site boundary.

The site is largely flat and level, although ground levels were noted to fall gently by approximately 1-2m in the north of the site, towards to the northern boundary.

6.1 Site Photographs

A series of photographs showing the site at the time of our investigation is included in Appendix C.

C GROUND INVESTIGATION

7 Strategy and Method

The strategy adopted for the intrusive investigation comprised the following:

Activity / *Method*	Purpose	Max Depth (bgl)	Installations / Notes
TP1-TP4 *8T Tracked Excavator*	Trial pits to investigate the shallow ground conditions and allow for the preliminary assessment of soakage potential using the BRE365 method, at locations agreed with the client.	2.8-3.0m	One day of testing undertaken as requested by the client's engineer.

Access was slightly restricted due to the presence of buildings, underground/overhead services and rubbish/fly-tipped waste etc. The exploratory hole locations are shown on Figure 2 in Appendix A.

In-situ test and sampling method descriptions employed are given in Appendix B together with the test results.

8 Weather Conditions

The fieldwork was carried out on 26th June 2020, at which time the weather was dry and sunny. Whilst in general, the winter of 2019/20 had been wetter than average, based on rainfall records from the Southern Water region, the 3 month period prior to the soakage testing was drier than average (see table below).

Month	Long Term Average Rainfall	Actual Rainfall	Actual vs Average Percentage
April 2020	51.8mm	47.2mm	90%
May 2020	52.8mm	6.7mm	15%
June 2020	53.0mm	44.8mm	85%

** Data source: https://www.southernwater.co.uk/water-for-life/regional-rainfall*

9 Soils as Found

The soils encountered are described in detail in the attached exploratory hole logs (Appendix A), but in general comprised a covering of Topsoil (0.3-0.4m) over stiff to very stiff, silty/plastic clay, with occasional ironstone gravel. Within trial pit TP3, carried out in an area of hardstanding composed of compacted granular, made ground was encountered to a depth of approximately 0.7m(bgl), which included frequent bricks and brick fragments, timber, plastic, plywood and rope etc.

10 Groundwater Observations

During the fieldwork, groundwater was not encountered in any of the trial pits prior to soakage testing.

D TEST RESULTS

11 Soakaways

11.1 Soakage Test Results

The BRE paper DG365 [3] describes a method for site testing to determine soil infiltration rates at the proposed site of a soakaway. The in-situ test method is described in Appendix B.

A total of four soakage tests were carried out across the site, at the locations shown on the attached site plan Figure 2, Appendix A. The full results of the soakage tests are presented within Appendix B.

For design purposes, the DG365, states that each pit should be allowed to drain three times to near empty, with filling on the same or consecutive days. However, as requested by the client's engineer, only a single day of testing was requested as a preliminary assessment of the soakage potential and given the very poor permeabilities anticipated due to the mapped presence of clay soils. The infiltration rate from each trial hole is summarised in the table below.

Test ID	Test Depth (bgl)	Design Infiltration Rate		Notes
		ℓ/m²/minute	m/sec	
TP1	0.94-3.00m	n/a	n/a	Water level did not fall at all (ie. <1cm) within the test period of 286 mins
TP2	0.97-2.90m	n/a	n/a	Water level did not fall at all (ie. <1cm) within the test period of 310 mins
TP3	0.98-3.00m	n/a	n/a	Water level did not fall at all (ie. <1cm) within the test period of 248 mins
TP4	0.98-2.80m	n/a	n/a	Water level did not fall at all (ie. <1cm) within the test period of 219 mins

Negligible infiltration was measured during the 219-310 minutes of the testing undertaken in each trial pit.

11.2 General Guidance on Design of Soakaways

Any soakaway/drainage scheme may require the approval of the Environment Agency and Building Control.

Soakaways are used to store the immediate surface water run-off from hard surfaced areas, such as roof or carparks, and allow for efficient infiltration into the adjacent soil. They should be designed to discharge their stored water sufficiently quickly to provide the necessary capacity to receive run-off from a subsequent storm. The time taken for discharge depends upon the soakaway shape and size, and the surrounding soil's infiltration characteristics.

Groundwater levels can vary considerably from season to season and year to year, often rising in wet or winter weather, and falling in periods of drought. As such, a high groundwater table may affect the storage capacity of soakaways. In addition, it should be noted that an unsaturated zone may be required between the base of soakaways and the groundwater table, by the Environment Agency. Longer term monitoring may be required to establish actual groundwater levels as part of the planning approval process.

REFERENCES

[1] BSI Standards, “BS 5930 Code of practice for ground investigations,” 2015.

[2] BSI Standards, “BS10175 Investigation of potentially contaminated sites – Code of practice,” 2013.

[3] Building Research Establishment (BRE), “DG365 Soakaway Design,” 2016.

[4] BSI Standards, “BS 3882:2015 Specification for Topsoil,” 2015.

[5] CIRIA, “C574 Engineering in Chalk,” 2002.

[6] R. N. Mortimore, Logging the Chalk, 2014.

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APPENDIX A

Site Plans, Trial Pit Logs and Trial Pit Photographs

A

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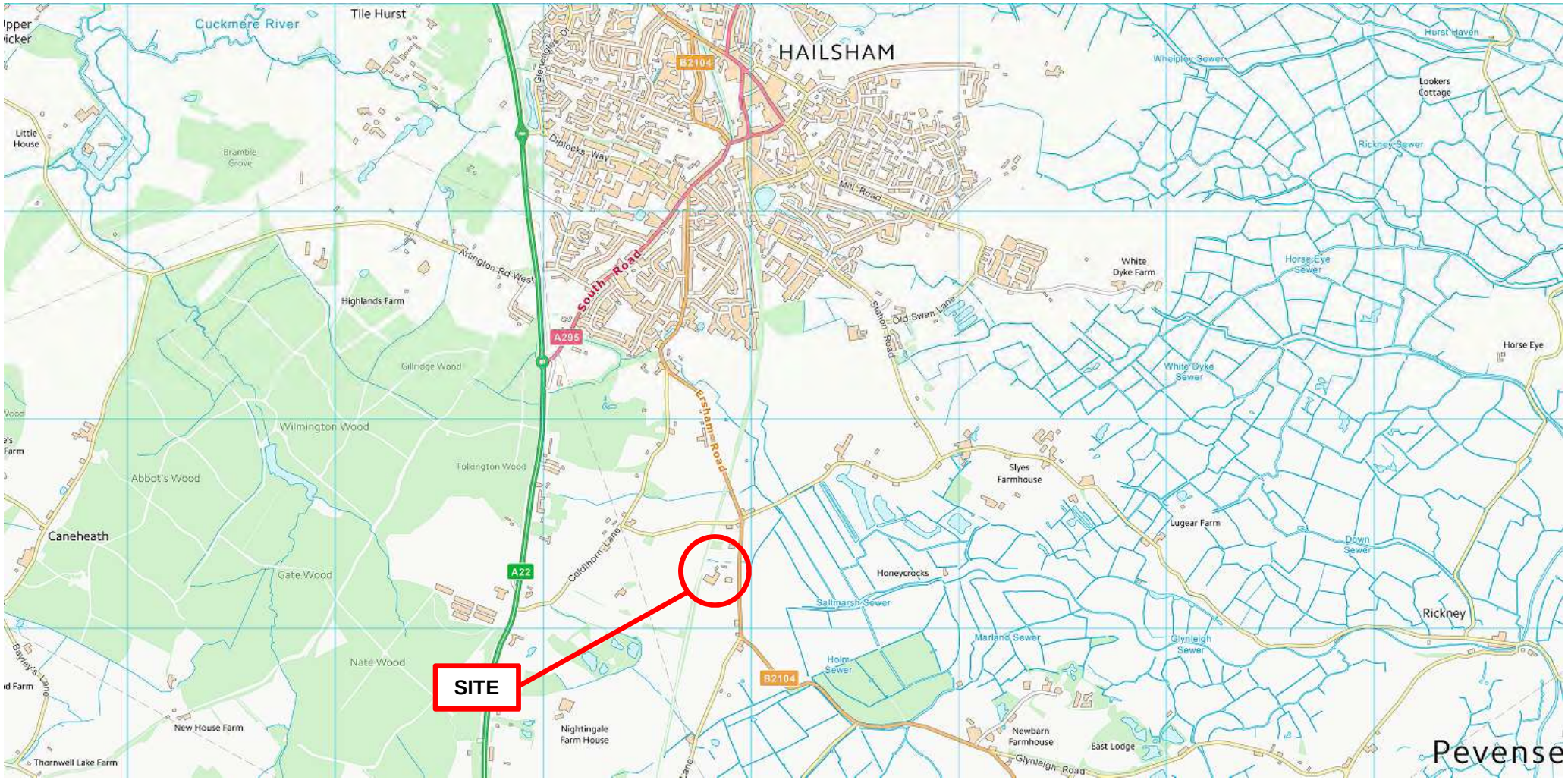
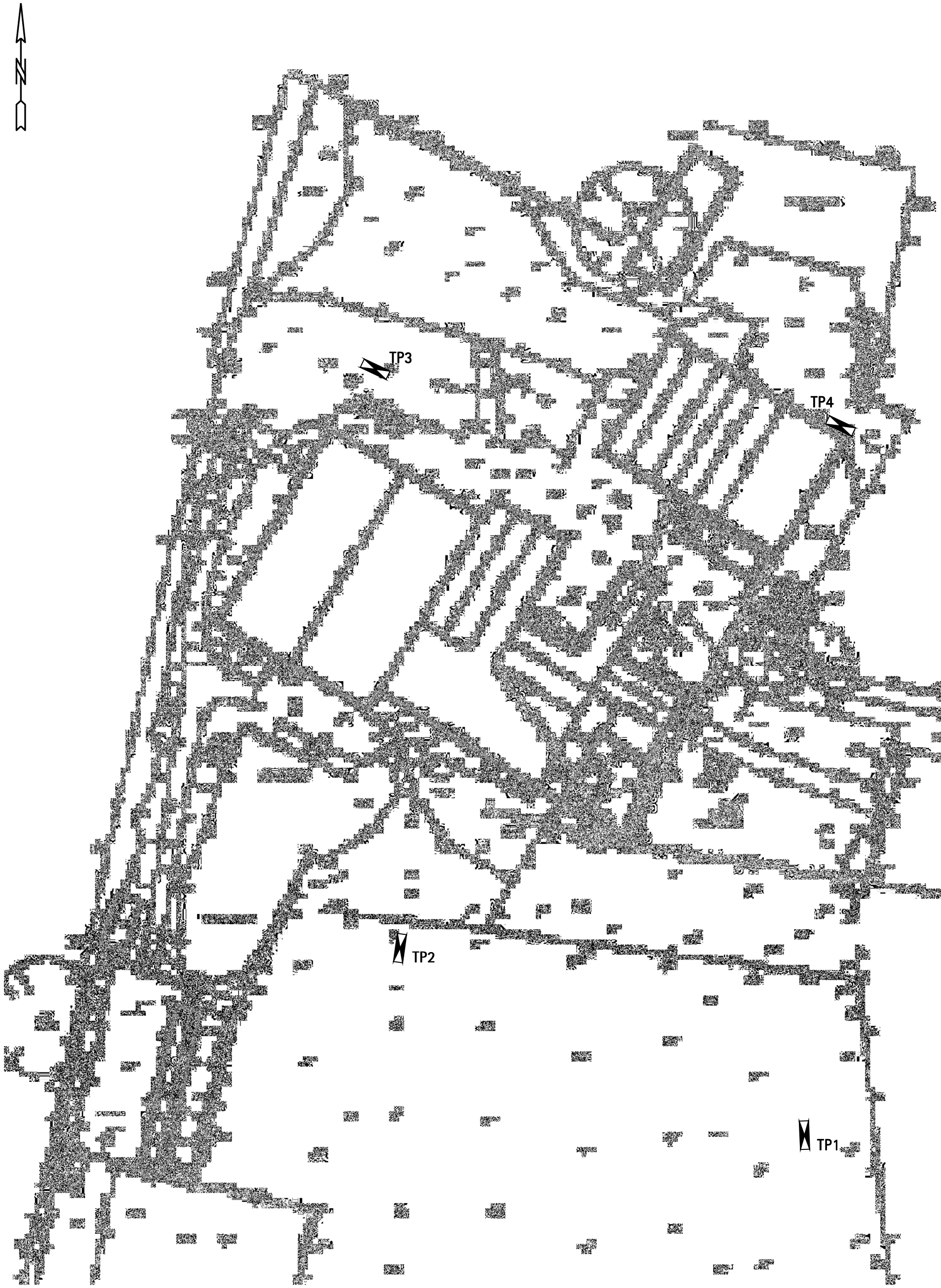


Site:	Old Loom Mill, Hailsham	Project Id:	J14496
Figure 1	Site Location Plan	Date:	July 2020



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

Site:	Old Loom Mill, Hailsham	STL: J14496	Fig No: 2
Date:	26 June 2020	Soakage Test Location Plan (not to scale)	

Southern Testing

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

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Key to Exploratory Hole Logs, Plans and Sections

Backfill Symbols		Pipe Symbols		Principal Soil Types		Principal Rock Types		Drilling Records	
Arisings		Plain Pipe		Topsoil		Mudstone		Water Strike	
Concrete		Slotted Pipe		Made Ground		Claystone		Depth Water Rose	
Blacktop		Piezometer		Clay		Siltstone		Total Core Recovery (%) [TCR]	
Bentonite		Piezometer Tip		Silt		Sandstone		Solid Core Recovery (%) [SCR]	
Gravel Filter		Filter Tip		Sand		Limestone		Rock Quality Index (%) RQD]	
Sand Filter		Extensometer		Gravel		Chalk		Fracture Index (fractures / m) [FI]	
		Inclinometers		Peat					

All soil and rock descriptions are in general accordance with BS5930 2015, BS EN ISO 14688-1:2002+A1:2013 and BS EN ISO 14689-1:2003. Chalk descriptions are also based on CIRIA C574 and "Logging the Chalk – R.N. Mortimer 2015". The Geology Code is only provided where a positive identification of the sample strata has been made.

Location / Method Identifiers	
BH	Borehole (undefined)
CP	Cable Percussive
RC	Rotary Core
RO	Rotary Open Hole
ODC	Rotary Odex/Symmetrix drilling cased
CP+RC	Cable Percussive to Rotary Core
SNC	Sonic
CFA	Continuous Flight Auger
FA	Flight Auger
VC	Vibro Core
WLS+RC	Windowless (Dynamic) Sampler to Rotary Core
WLS	Windowless Sampler
WS	Window Sampler
HA	Hand Auger
C	Road / Pavement Core
IP	Inspection Pit (Hand Excavation)
TP	Trial Pit (Machine Excavated)
OP	Observation Pit (Supported Excavation Hand or Machine)

In-situ Test Location / Method	
DP	Dynamic Probe
CPT	Cone Penetration Test
CBR	In-situ CBR Test
DCP	CBR using Dynamic Cone Penetrometer
CBRT	CBR using TRL Probe
PB	Plate Bearing Test
SPT (S)	Standard Penetration Test (Split Barrel Sampler)
SPT (C)	Standard Penetration Test (Solid Cone)
N	SPT Result
-/-	Blows/Penetration (mm) after seating drive
-*/-	Total Blows / Penetration (mm)
( )	Extrapolated Value
PPT	Perth Penetration (In-House Method - Equivalent N Value)
HP / UCS	Strength from Hand Penetrometer (kN/m^2)
IVN	Strength from Hand Vane ((kN/m^2) P = peak, R = residual
PID	Photo Ionisation Detector (ppm)
MEXE	Mexi-Cone CBR (%)

Samples / Test Type	
B	Bulk Sample
BLK	Block Sample
C	Core Sample
CBRS	CBR Mould Sample
D	Small Disturbed Sample
ES	Environmental Sample (Soil)
EW	Environmental Sample (Water)
GS	Environmental Sample (Gas)

Samples / Test Type	
SPTLS	Standard Penetration Test Split Barrel Sample
TW	Thin Wall Push In Sample (e.g. Shelby Sampler)
U	Undisturbed Open Drive Sample (blows to take)
UT	Thin Wall Undisturbed Open Drive Sample (blows to take)
W	Water Sample (Geotechnical)
SP	Sample from Stockpile
P	Piston Sample
AMAL	Amalgamated Sample

Southern Testing ST Consult

www.southerntesting.co.uk tel:01342 333100 www.stconsult.co.uk tel:01604 500020

Start - End Date:	Project ID:	Machine Type:	TP1
26/06/2020	J14496	8T Tracked	Sheet 1 of 1

Project Name:	Old Loom Mill, Hailsham	Remarks:	Co-ordinates:	Level (m AOD):	Logger:
				6.70	CL
Location:	Ersham Road, Hailsham, East Sussex	1. BRE365 Soakage Test Pit. 2. Ground level interpolated from supplied site survey drawing.			
Client:	Aitco Ltd				

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m)	Type	Results					
			6.3	(0.40)		0.40	Light greyish brown, friable, silty CLAY, with frequent rootlets and very occasional fine angular brick fragments (TOPSOIL).
0.50	HP	UCS(kPa)=500.00		(0.70)			Stiff to very stiff, greyish brown and orange brown, silty CLAY. [0.4-0.8m: Soils desiccated] [Off-white silty calcareous lenses at approx. 0.8m]
1.00	HP	UCS(kPa)=150.00	5.6			1.10	Very stiff, light grey and light yellowish brown, plastic CLAY. [Becoming brown and light blue grey below approx. 1.5m]
2.00	HP	UCS(kPa)=160.00		(1.90)			[With occasional lenses of dark brown/black, fine to medium, angular, ironstone gravel below approx. 2.6m]
3.00	HP	UCS(kPa)=200.00	3.7			3.00	Pit terminated at 3.00m.

Pit Dimension (m)		Pit Stability:	Water Strikes:
Width:	0.45	Trial pit stable during excavation.	Trial pit dry.
Length:	1.50		
Depth:	3.00		

Southern Testing ST Consult	Start - End Date:	Project ID:	Machine Type:	TP2
www.southerntesting.co.uk tel:01342 333100 www.stconsult.co.uk tel:01604 500020	26/06/2020	J14496	8T Tracked	Sheet 1 of 1

Project Name:	Old Loom Mill, Hailsham	Remarks:	Co-ordinates:	Level (m AOD):	Logger:
				7.80	CL
Location:	Ersham Road, Hailsham, East Sussex	1. BRE365 Soakage Test Pit. 2. Ground level interpolated from supplied site survey drawing.			
Client:	Aitco Ltd				

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m)	Type	Results					
			7.5	(0.30)		0.30	Light brown, friable, silty CLAY, with frequent rootlets (TOPSOIL).
				(0.40)			Very stiff, brown, desiccated, slightly sandy, silty CLAY, with frequent fine to medium angular black ironstone gravel.
			7.1			0.70	Stiff, grey and brown, plastic CLAY.
1.00	HP	UCS(kPa)=180.00					
				(2.20)			[1.8-2.2m: Light grey and light yellowish brown, very silty CLAY]
2.00	HP	UCS(kPa)=310.00					[With very occasional polished fissure surfaces noted below 2.0m]
2.90	HP	UCS(kPa)=200.00	4.9			2.90	Pit terminated at 2.90m.

Pit Dimension (m)		Pit Stability:	Water Strikes:
Width:	0.45	Trial pit stable during excavation.	Trial pit dry.
Length:	1.60		
Depth:	2.90		

Southern Testing ST Consult	Start - End Date:	Project ID:	Machine Type:	TP3
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Project Name:	Old Loom Mill, Hailsham	Remarks:	Co-ordinates:	Level (m AOD):	Logger:
				6.30	CL
Location:	Ersham Road, Hailsham, East Sussex	1. BRE365 Soakage Test Pit. 2. Ground level interpolated from supplied site survey drawing.			
Client:	Aitco Ltd				

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m)	Type	Results					
			6.1	(0.20)		0.20	Light greyish pink, slightly silty, very sandy, fine to coarse, angular, limestone GRAVEL (subbase).
				(0.50)			Dark brown, very sandy CLAY, with frequent bricks and brick fragments, timber, plastic, plywood and rope (MADE GROUND).
0.70	HP	UCS(kPa)=120.00	5.6			0.70	Firm to stiff, light grey and light yellowish brown, slightly CLAY.
1.00	HP	UCS(kPa)=90.00					[0.7-1.3m: In western third of pit - pocket of soft to firm, dark grey, organic, very silty CLAY]
1.50	HP	UCS(kPa)=200.00					
				(2.30)			[1.8-2.5m: Very silty]
2.00	HP	UCS(kPa)=110.00					
			3.3			3.00	Pit terminated at 3.00m.

Pit Dimension (m)		Pit Stability:	Water Strikes:
Width:	0.45	Trial pit stable during excavation.	Trial pit dry.
Length:	1.40		
Depth:	3.00		

Southern Testing ST Consult	Start - End Date:	Project ID:	Machine Type:	TP4
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Project Name:	Old Loom Mill, Hailsham	Remarks:	Co-ordinates:	Level (m AOD):	Logger:
				5.70	CL
Location:	Ersham Road, Hailsham, East Sussex	1. BRE365 Soakage Test Pit. 2. Ground level interpolated from supplied site survey drawing.			
Client:	Aitco Ltd				

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m)	Type	Results					
				(0.40)			Brown, very silty, friable, very silty CLAY, with frequent rootlets (TOPSOIL).
			5.3			0.40	Firm to stiff, orange brown and light grey, plastic CLAY, with occasional polished fissure surfaces.
1.00	HP	UCS(kPa)=120.00					
				(2.40)			[1.5-1.8m: Orange and brownish orange, blocky fissured, CLAY, with fine to medium, extremely weak, mudstone gravel]
2.00	HP	UCS(kPa)=250.00					
							[Becoming light grey and light yellowish brown below approx. 2.1m]
							[With occasional lenses of dark brown/black, fine to medium, angular, ironstone gravel below approx. 2.5m]
2.80	HP	UCS(kPa)=220.00	2.9			2.80	Pit terminated at 2.80m.

Pit Dimension (m)		Pit Stability:	Water Strikes:
Width:	0.45	Trial pit stable during excavation.	Trial pit dry.
Length:	1.70		
Depth:	2.80		

Trial Pit TP1 (Pit)

Trial Pit TP1 (Spoil)

Trial Pit TP2 (Pit – full of water)

Trial Pit TP2 (Spoil)

Trial Pit TP3 (Pit)

Trial Pit TP3 (Spoil)

Trial Pit TP4 (Pit)

Trial Pit TP4 (Spoil)

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APPENDIX B

Field Sampling and In-Situ Test Methods and Results

B

Soil and Rock Descriptions

All soil and rock descriptions are in general accordance with BS5930 Ref [1].

Anthropogenic soils ('made ground' or 'fill') describe materials which have been placed by man and can be divided into those composed of reworked natural soils and those composed of or containing man-made materials. 'Fill' is used to describe material placed in a controlled manner and 'made ground' is used to describe materials placed without strict engineering control.

The classification of materials such as topsoil is based on visual description only and should not be interpreted to mean that the material complies with criteria used in BS 3882 Ref [4].

Chalk descriptions are based on CIRIA C574 Ref [5] and Mortimore Ref [6].

The geology code is only provided on logs where a positive identification of the sample strata has been made.

Trial Pits and Trenches

Trial pits and trenches are unsupported excavations, mechanically excavated by machine to the required depth to enable visual examination, in situ testing and sampling as required from outside the excavation.

Hand Penetrometer Test

The handheld soil penetrometer consists of a spring loaded and calibrated plunger which is forced into cohesive soil. A reading of unconfined compression strength (equal to twice cohesion) is given on a calibrated scale. The average of a set of three readings shall be recorded.

In common with other hand methods of strength assessment it does not give an accurate indication of bearing capacity in stiff or fissured soils, because of the small test area.

Soakage Tests (after BRE DG365 2016)

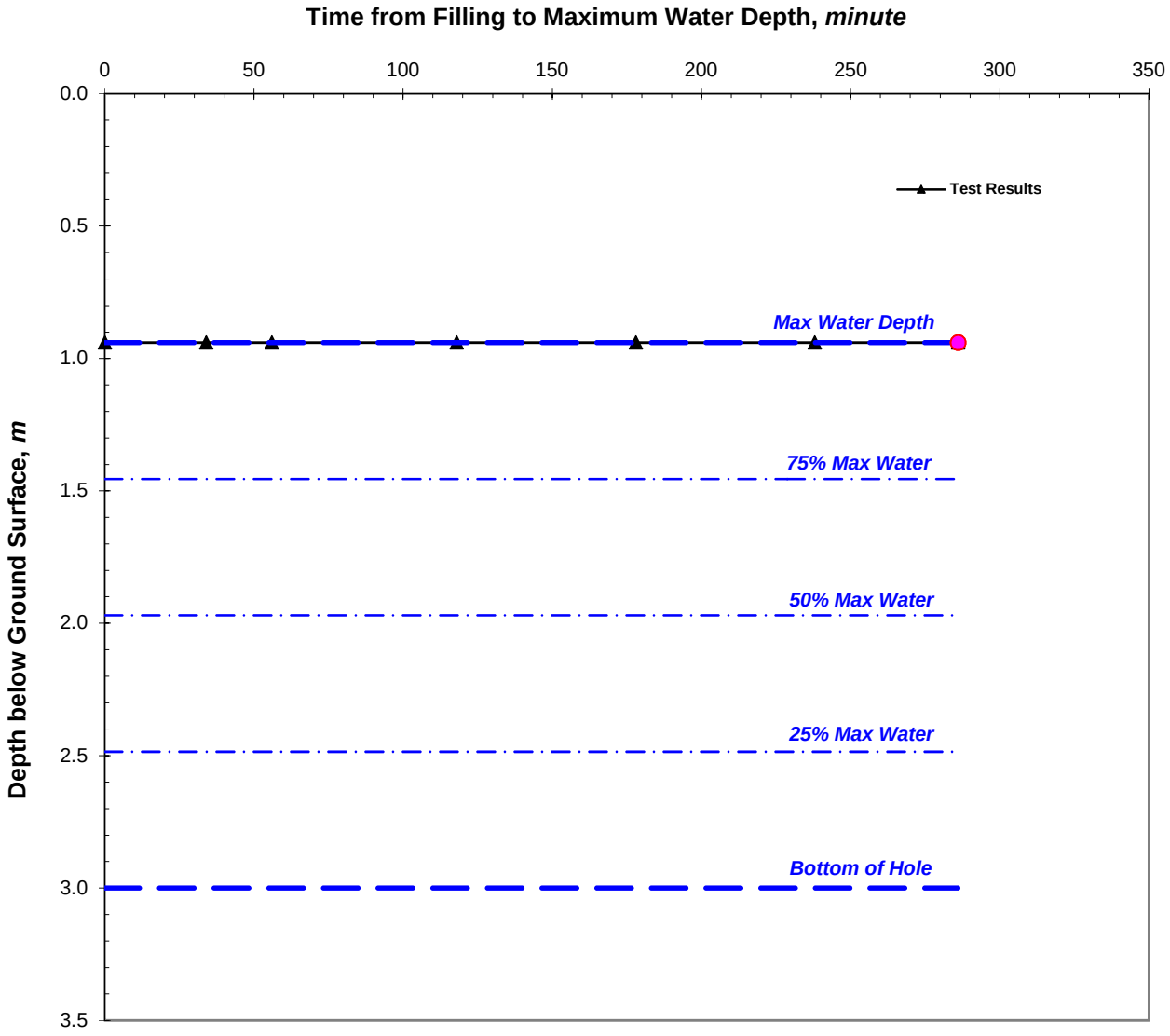
The BRE DG365 Ref [3] paper on soakaway design allows for the design of trench soakaways as well as traditional square and circular soakaways.

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. Water levels are recorded against time. Where the sides are unstable the pit should be filled with granular material to provide stability during the test.

Calculated soakage rates are expressed as l/m²/minute, which is a convenient rate to use. The BRE use a unit of m/sec, which is the value in l/m²/minute divided by 60,000.

BRE Digest DG365 Soakage Test

Test Hole No: TP1
Test No: Test No 1 (Initial)



Pit Length, m	1.500	Depth to Water at Start of Test, *m*	0.940
Pit Width, m	0.450	Max Water Dropdown during Test, *m*	0.000
Depth to Pit Base, m	3.000	Total Soakage Test Time, *min*	286.0
Depth to Top of Permeable Soils, *m*		Mean Internal Discharge Area, m^2	8.709
Depth to Groundwater Surface, *m*		Discharge Rate, *litre/min*	0.000
Depth to Top of Granular Fill, *m*		Soakage Rate, *litre/m^2/min*	**0.0000**
Voids Assumed for Granular Fill, %	100%	BRE Soil Infiltration Rate, *m/sec*	**0.00E+00**

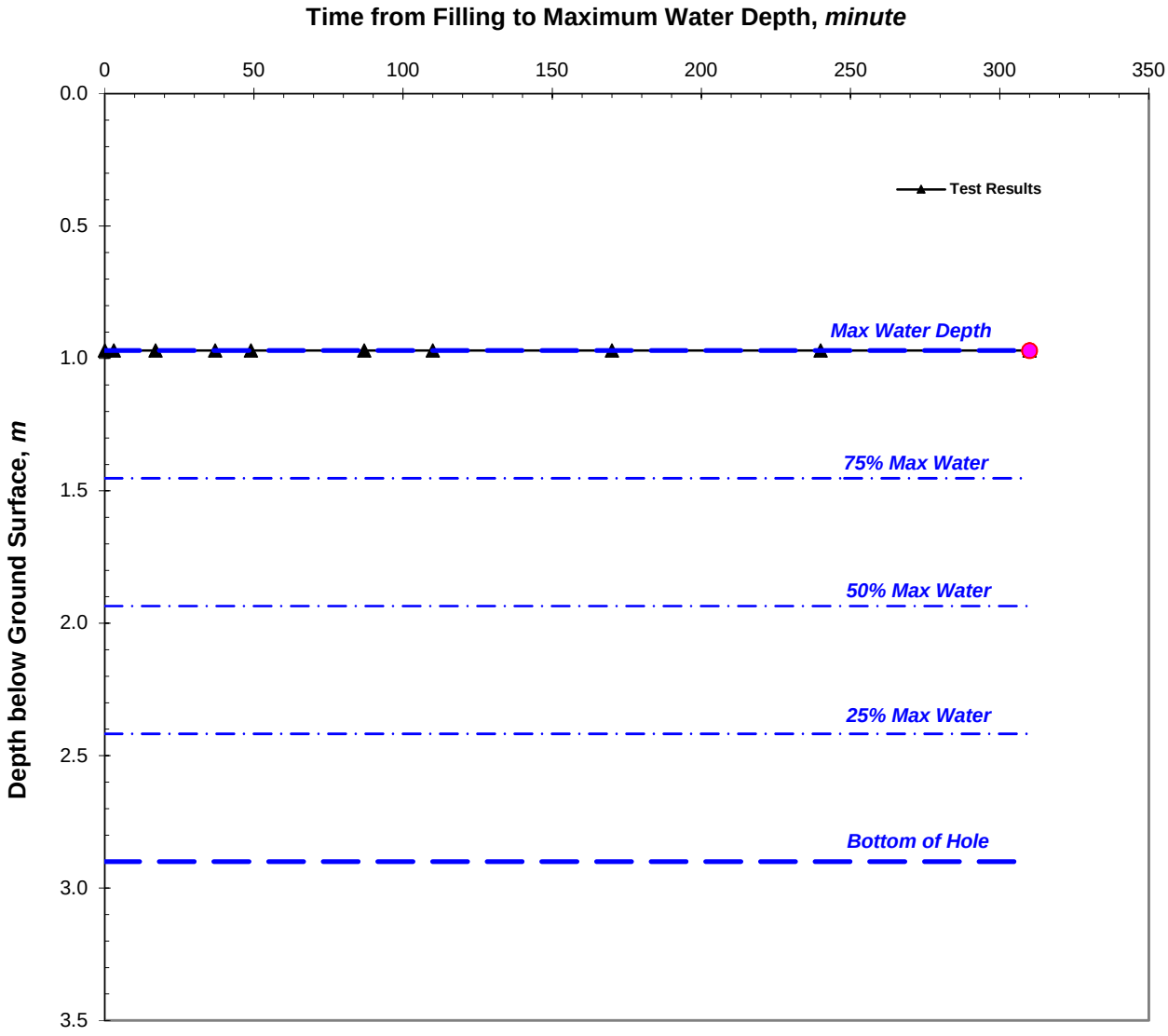
Comments:

Water level did not fall to 75% max water depth, calculations were based on actual fall of water level achieved.
Result not compliant with BRE365 requirement since water did not fall to 25% max water depth.

Client:	Aitco Ltd.	**Job No:**	J14496	**Test Date:**	30/Jan/2019		
Site:	Old Loom Mill, Hailsham	**Tested By:**	OS	**Engineer:**	CL	**Fig.**	**S1**

BRE Digest DG365 Soakage Test

Test Hole No: TP2
Test No: Test No 1 (Initial)



Pit Length, m	1.600	Depth to Water at Start of Test, *m*	0.970
Pit Width, m	0.450	Max Water Dropdown during Test, *m*	0.000
Depth to Pit Base, m	2.900	Total Soakage Test Time, *min*	310.0
Depth to Top of Permeable Soils, *m*		Mean Internal Discharge Area, m^2	8.633
Depth to Groundwater Surface, *m*		Discharge Rate, *litre/min*	0.000
Depth to Top of Granular Fill, *m*		Soakage Rate, *litre/m^2/min*	**0.0000**
Voids Assumed for Granular Fill, %	100%	BRE Soil Infiltration Rate, *m/sec*	**0.00E+00**

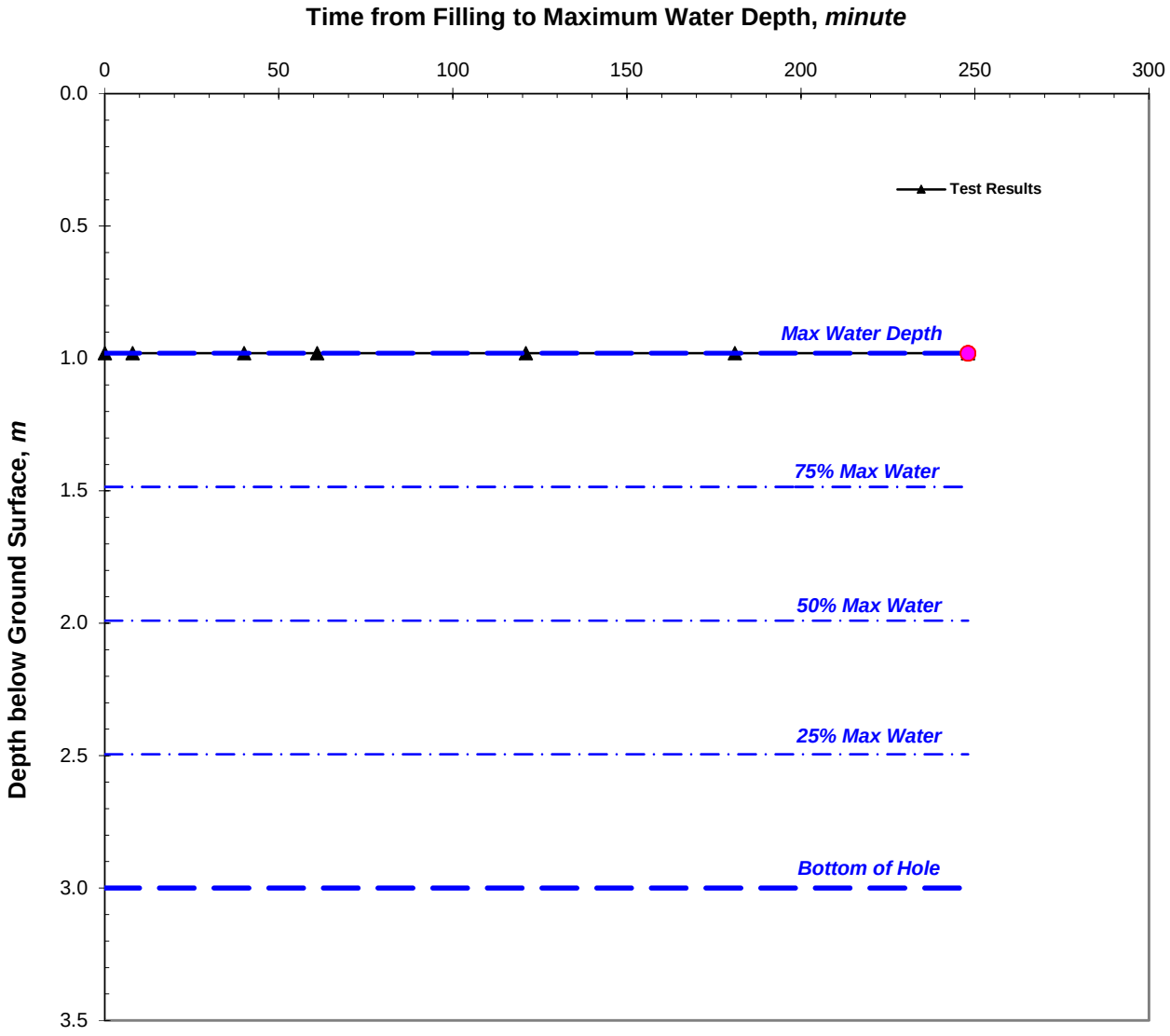
Comments:

Water level did not fall to 75% max water depth, calculations were based on actual fall of water level achieved.
Result not compliant with BRE365 requirement since water did not fall to 25% max water depth.

Client: Aitco Ltd.	**Job No:** J14496	**Test Date:**		
Site: Old Loom Mill, Hailsham	**Tested By:** OS	**Engineer:** CL	**Fig. S2**	

BRE Digest DG365 Soakage Test

Test Hole No: TP3
Test No: Test No 1 (Initial)



Pit Length, m	1.400	Depth to Water at Start of Test, *m*	0.980
Pit Width, m	0.450	Max Water Dropdown during Test, *m*	0.000
Depth to Pit Base, m	3.000	Total Soakage Test Time, *min*	248.0
Depth to Top of Permeable Soils, *m*		Mean Internal Discharge Area, m^2	8.104
Depth to Groundwater Surface, *m*		Discharge Rate, *litre/min*	0.000
Depth to Top of Granular Fill, *m*		Soakage Rate, $litre/m^2/min$	**0.0000**
Voids Assumed for Granular Fill, %	100%	BRE Soil Infiltration Rate, *m/sec*	**0.00E+00**

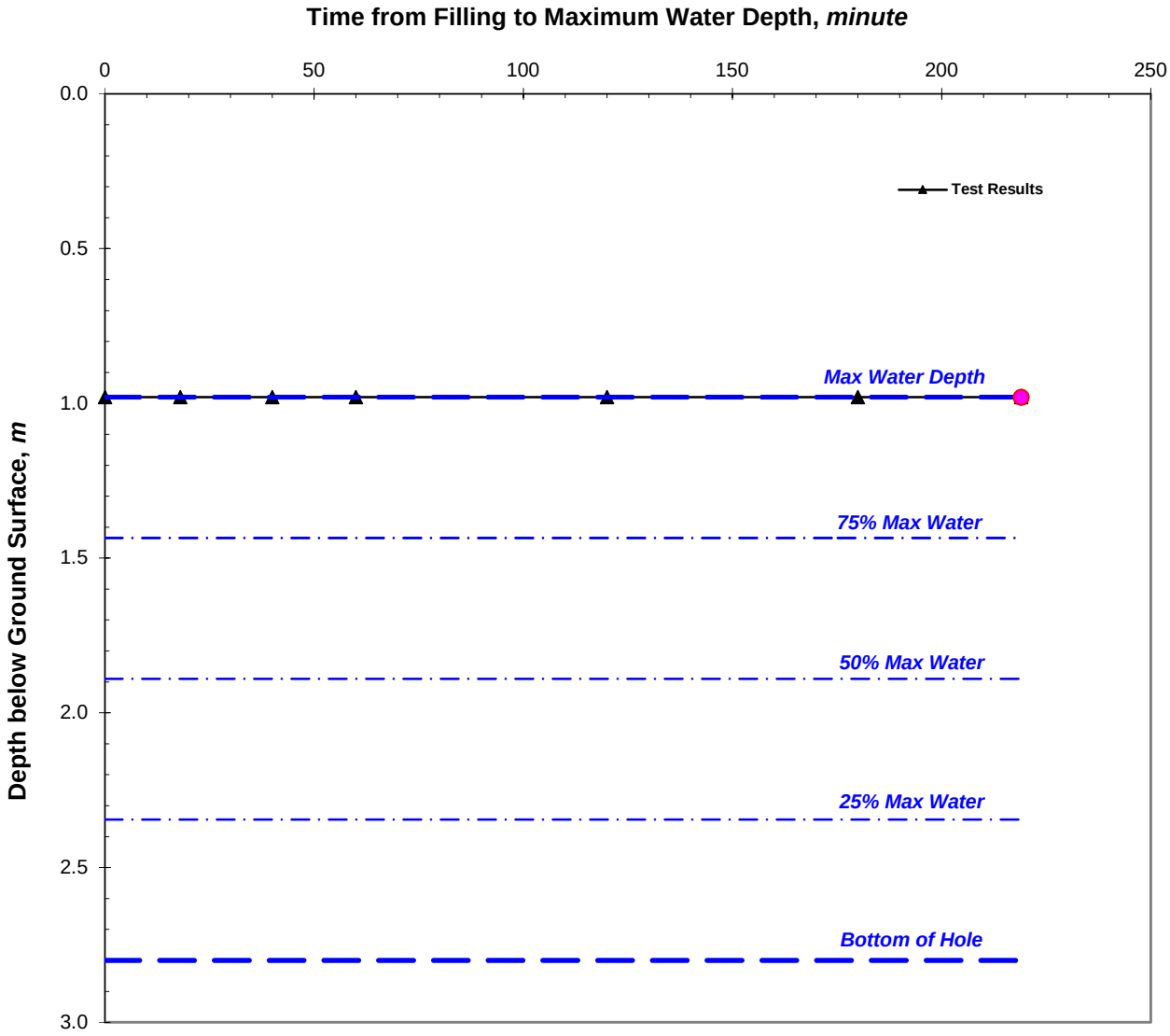
Comments:

Water level did not fall to 75% max water depth, calculations were based on actual fall of water level achieved.
Result not compliant with BRE365 requirement since water did not fall to 25% max water depth.

Client: Aitco Ltd.	**Job No:** J14496	**Test Date:**		
Site: Old Loom Mill, Hailsham	**Tested By:** OS	**Engineer:** CL	**Fig. S3**	

BRE Digest DG365 Soakage Test

Test Hole No: TP4
Test No: Test No 1 (Initial)



Pit Length, m	1.700	Depth to Water at Start of Test, *m*	0.980
Pit Width, m	0.450	Max Water Dropdown during Test, *m*	0.000
Depth to Pit Base, m	2.800	Total Soakage Test Time, *min*	219.0
Depth to Top of Permeable Soils, *m*		Mean Internal Discharge Area, m^2	8.591
Depth to Groundwater Surface, *m*		Discharge Rate, *litre/min*	0.000
Depth to Top of Granular Fill, *m*		Soakage Rate, *litre/m^2/min*	**0.0000**
Voids Assumed for Granular Fill, %	100%	BRE Soil Infiltration Rate, *m/sec*	**0.00E+00**

Comments:

Water level did not fall to 75% max water depth, calculations were based on actual fall of water level achieved.
Result not compliant with BRE365 requirement since water did not fall to 25% max water depth.

Client: Aitco Ltd.		**Job No:** J14496	**Test Date:**	
Site: Old Loom Mill, Hailsham		**Tested By:** OS	**Engineer:** CL	**Fig. S4**

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APPENDIX C

Site Photographs

C

Photo 1 – View from the SE (looking W)

Photo 2 – View of the SW of the site (looking S)

Photo 3 – View from the centre-W (looking E)

Photo 4 – View from the SW (looking N)

Photo 5 – View of the NE site area (looking SE)

Photo 6 – View of the NE site area (looking N)

Photo 7 – View of the buildings in the centre-E (looking SSW)

Photo 8 – View of the buildings in the centre-E (looking WNW)

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ST Consult
Environmental & Geotechnical

Head Office
East Grinstead
Tel: 01342 333100
enquiries@southerntesting.co.uk

ST Consult Midlands
Northampton
Tel: 01604 500020
creaton@stconsult.co.uk

ST Consult Thames Valley
Hannington
Tel: 01635 800 950
hannington@stconsult.co.uk

ST Consult North West
Warrington
Tel: 01925 661 735
warrington@stconsult.co.uk

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