Surface Water Drainage and Foul Drainage Technical Note

Prepared for:
Aitco Ltd

August 2020

Location:
Old Loom Mill
Earsham Road
Halisham
BN27 2RH

Our reference:
89594-Ecotecture-OldLoomMill v1.1 180820

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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:	Surface Water Drainage and Foul Drainage Technical Note				
Project No.:	89594	**Date:**	18th August 2020	**Issue No.:**	1.1
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1. Introduction

1.1. This Surface Water and Foul Drainage Technical Note has been prepared by Unda Consulting Limited on behalf of Aitco Ltd, to address pre-commencement Conditions 9, 10, 11 and 12.

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.

1.4. This report assesses the surface water and foul drainage arrangements for the proposed development, which forms Conditions 9, 10, 11 and 12. Conditions 9, 10, 11 and 12 state the following:

Condition 9
No development approved by this permission shall be commenced until full details of the proposed means of foul drainage disposal have been submitted to and approved in writing by the Local Planning Authority. The approved drainage works shall be completed prior to the completion or occupation of any dwelling on site, whichever is the sooner. DF01

Reason:
In order to secure a satisfactory standard of development, having regard to SPO12, SPO13 and WCS14 to the Wealden Core Strategy Local Plan 2013 and Saved Policy CS2 of the adopted Wealden Local Plan 1998, coupled with the requirements of paragraph 109 of the National Planning Policy Framework 2012.

Condition 10:
No development shall take place until details of surface water drainage, which shall follow the principles of sustainable drainage as far as practicable, including details of treatment of surface water prior to its outfall, have been submitted to and approved by the Local Planning Authority. The drainage shall be provided in accordance with the approved details before first occupation of the related dwelling. DS02

Reason:
To prevent an increased risk of flooding, having regard to Saved Policy CS2 of the adopted Wealden Local Plan, coupled with the requirements of paragraph 103 of the National Planning Policy Framework 2012 and the Wealden Design Guide, Chapter 4, Sections 8 and 9.

Condition 11
Details for the long term maintenance arrangements for any parts of the drainage system which will not be adopted (including ponds, ditches, swales, permeable paving, land drains) to be submitted and approved in writing by the Local Planning Authority prior to the first occupation of any of the dwellings hereby permitted. The submitted details should specify the responsibilities of each party for the implementation of the SUDS scheme, a timetable for implementation, provide a management plan and maintenance plan for the lifetime of the development which should include arrangements for adoption by any public authority or statutory undertaker and any other arrangement to secure then operation of the scheme throughout its life time. The management and maintenance arrangements shall be carried out in accordance with the approved details over the period specified. DS05 (M)

Reason:
To ensure the satisfactory maintenance of unadopted drainage systems in accordance with Saved Policy CS2 of the adopted Wealden Local Plan, coupled with the requirements of paragraph 103 of the National Planning Policy Framework 2012 and the Wealden Design Guide, Chapter 4, Sections 8 and 9.

Condition 12:
There shall be no discharge of foul or contaminated drainage from the site into either the groundwater or any surface waters, whether direct or via soakaways. Prior to being discharged into any watercourse, surface water sewer or soakaways system, all surface water drainage from parking areas and hardstandings shall be passed through trapped gullies and silt traps to BS 5911:1982 with an overall capacity compatible with the site being drained and shall be retained thereafter.

Reason:
To prevent pollution of the water environment in accordance with Saved Policy CS2 of the adopted Wealden Local Plan, coupled with the requirements of paragraph 109 of the National Planning Policy Framework 2012 and the Wealden Design Guide, Chapter 4, Sections 8 and 9.

1.5. This Technical Note provides the information required to address the surface water and foul drainage elements of planning Conditions 9, 10, 11 and 12.

2. Existing Site:

2.1. The site is occupied by a former mill and is approximately 14631m^2 in size. The site is comprised of a number of buildings and is currently utilised by a collection of craft shops and stalls including a tea room. The existing buildings are predominantly located in the centre west and north of the site with vacant land to the south. According to plans provided by the client, the main area of the site is accessed via a two-way tarmacked road off the B2104 adjacent east. Google imagery indicates that the proposed development area, in the west of the site, is already largely underlain by hardstanding.

2.2. According to available information the site is currently underlain by approximately 5483m^2 of hardstanding comprising 2342m^2 of built footprint and 3141m^2 of concrete. As such, the existing site is considered to be formed of approximately 37% impermeable surfaces.

2.3. The site is located approximately 1.1km south of Hailsham, a civil parish and the administrative centre of the Wealden District of East Sussex. The application area is bound to the south by agricultural land with a residential dwelling adjacent north. According to aerial imagery the site is located adjacent east of the Cuckoo Trail and approximately 2.46km north of Polegate train station.

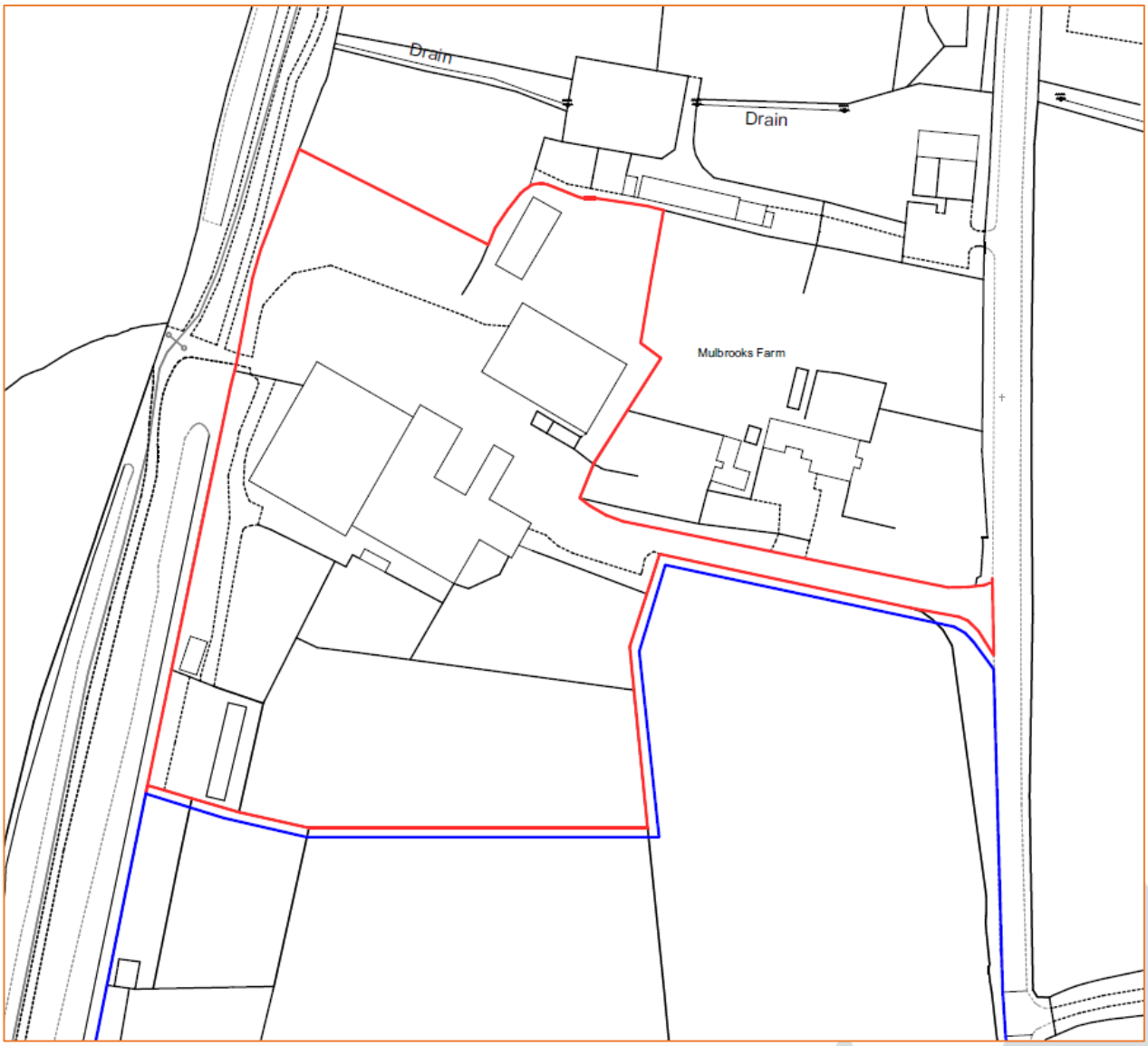


Figure 1: Site Location (Source: Ecotecture)

Figure 2: Aerial Imagery (Source: Google)

Site Topography:

2.4. 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.

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

2.6. 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:

2.7. The 1:50,000 BGS map shows the site to be located directly upon the bedrock of Weald Clay Formation – Mudstone. This strata is reported to have been formed during between the Hauterivian Age and Barremian Age.

2.8. BGS mapping indicates that the site is not underlain by superficial deposits.

2.9. The soil type taken from the BGS UKSO Soil Map Viewer, shows a soil parent material of Deep Claystone/Mudstone with a soil texture of Clay to Clayey Loam.

2.10. Despite being reportedly underlain by Weald Clay Formation infiltration testing has been undertaken at the site.

2.11. An intrusive site investigation was undertaken by Southern Testing in June 2020 and a factual soakage test report issued on 8th July 2020. Given the size of the site, a total of four trial pits were excavated throughout the proposed development area to varying depths of between 2.8m and 3.0mbgl (refer to TP1 – TP4 on location plan in soakage report appendix).

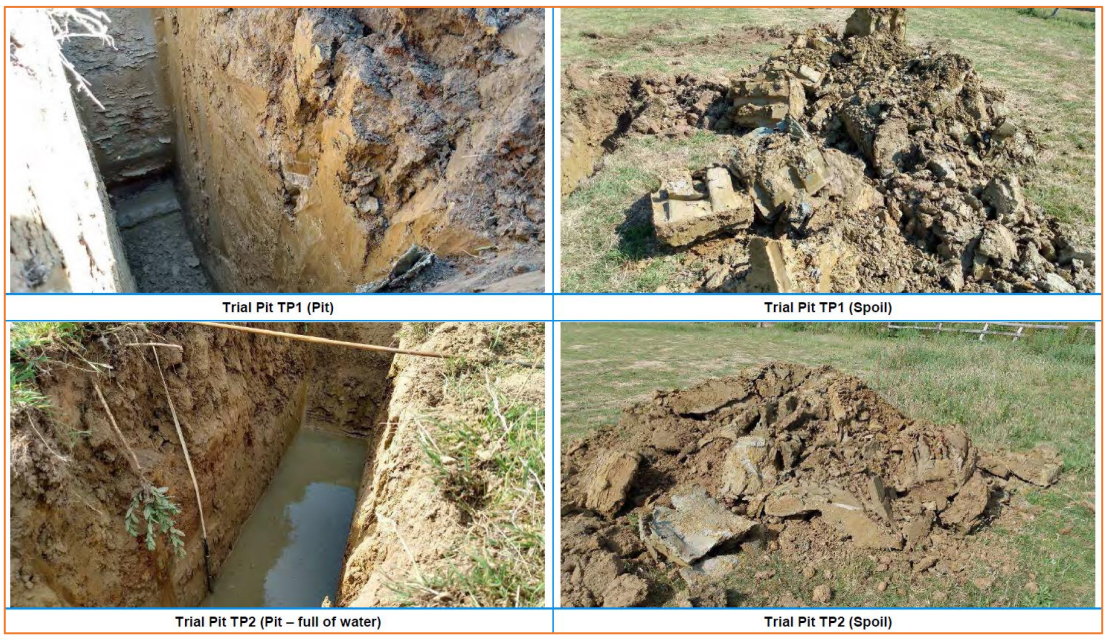


Figure 3: Photographs of Infiltration Testing Trial Pits 1 and 2 (Source: Southern Testing Ltd)

Figure 4: Photographs of Infiltration Testing Trial Pits 3 and 4 (Source: Southern Testing Ltd)

2.12. According to Southern Testing Ltd, the underlying strata generally comprised Topsoil (0.3-0.4m) over stiff to very stiff, silty/plastic clay, with occasional ironstone gravel.

2.13. A summary of the infiltration test results have been provided by Southern Testing (refer 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

Figure 5: Infiltration Test Results (Source: Southern Testing)

2.14. 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.

2.15. There are no borehole logs in vicinity to the site.

2.16. The published Environment Agency Groundwater Vulnerability map shows the site is not located within an area classified as a Groundwater Source Protection Zone.

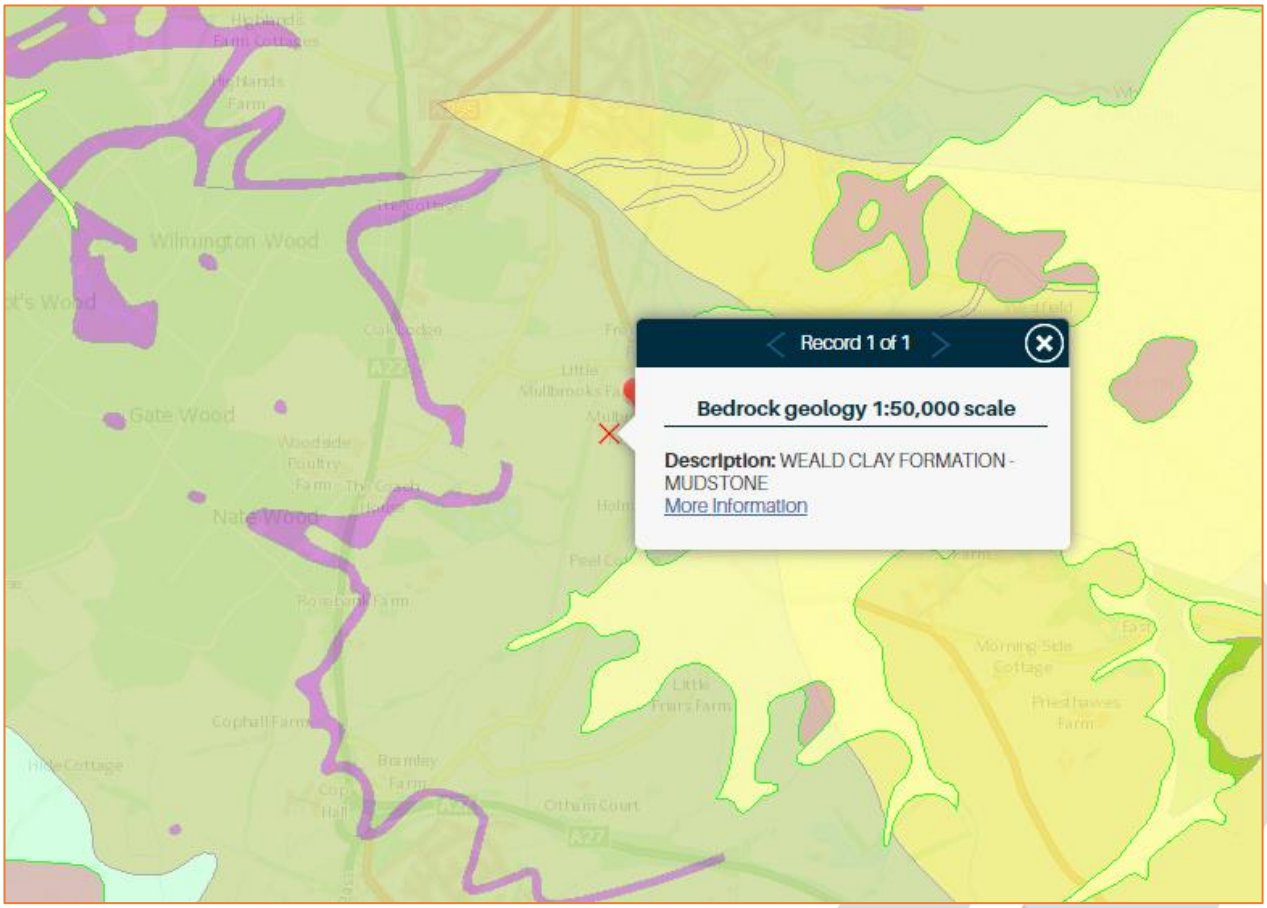


Figure 6: BGS Bedrock Geology (Source: BGS)

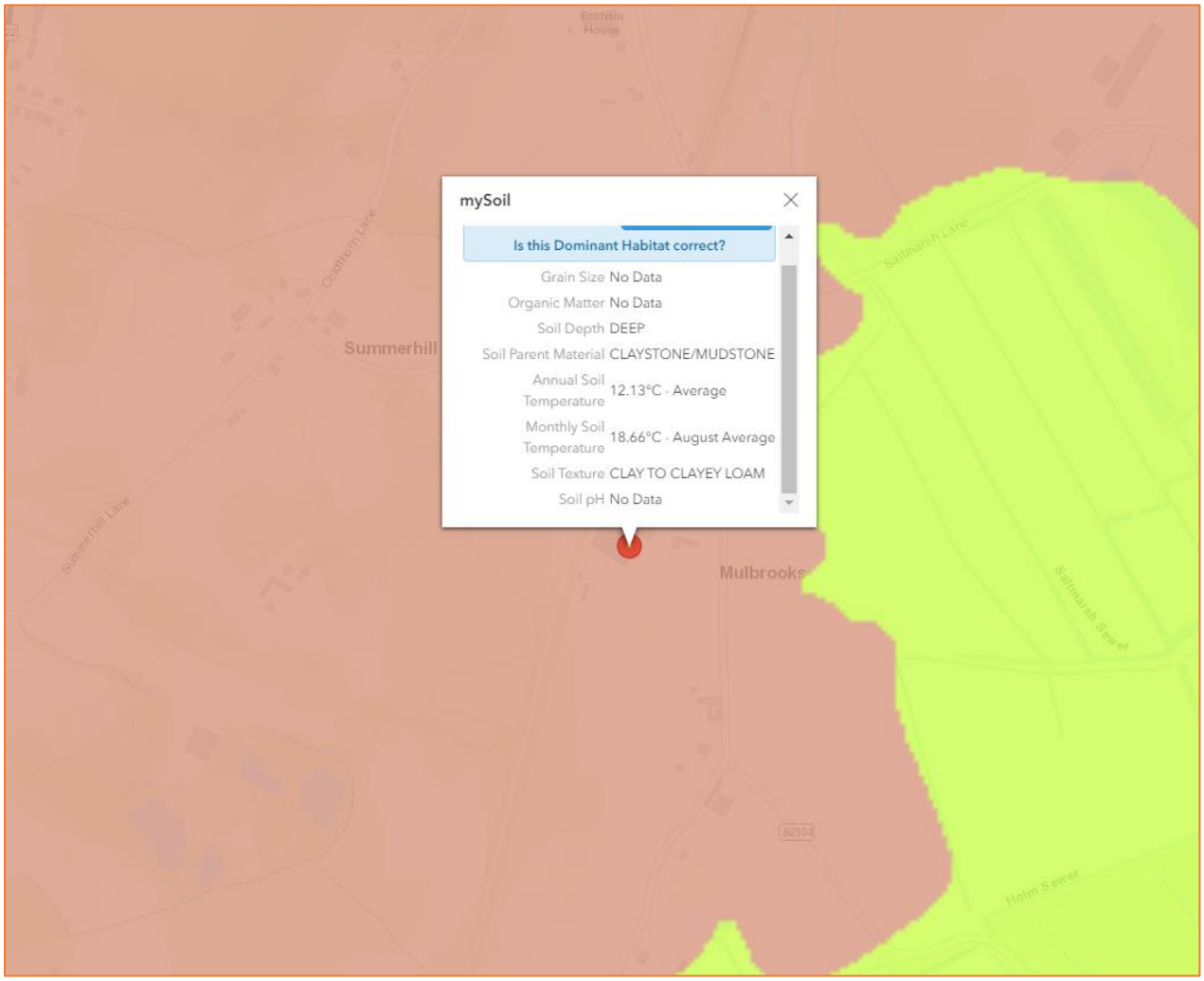


Figure 7: Soil Map (Source: UK Soils, BGS)

Nearby Watercourses / Drainage Features:

2.17. There are no existing watercourses or rivers at the site or along the application boundary.

2.18. According to information provided by the client the nearest watercourse to the site is an unnamed open channel some 35m north. It is reported that current building operations discharge into this watercourse via an existing piped service connection.

2.19. The aforementioned drainage channel appears to flow in an easterly direction towards the Pevensey Level National Nature Reserve.

2.20. Pevensey Levels is a 3603 hectare biologically important area designated a Site of Special Scientific Interest for its rich aquatic flora and fauna.

Existing Drainage:

2.21. The client has provided information which indicates that surface water runoff from the existing mill buildings is discharged into a watercourse some 35m north via a private surface water connection. This open channel reportedly conveys water in an easterly direction, through a culvert under Ersham Road and towards Saltmarsh Sewer.

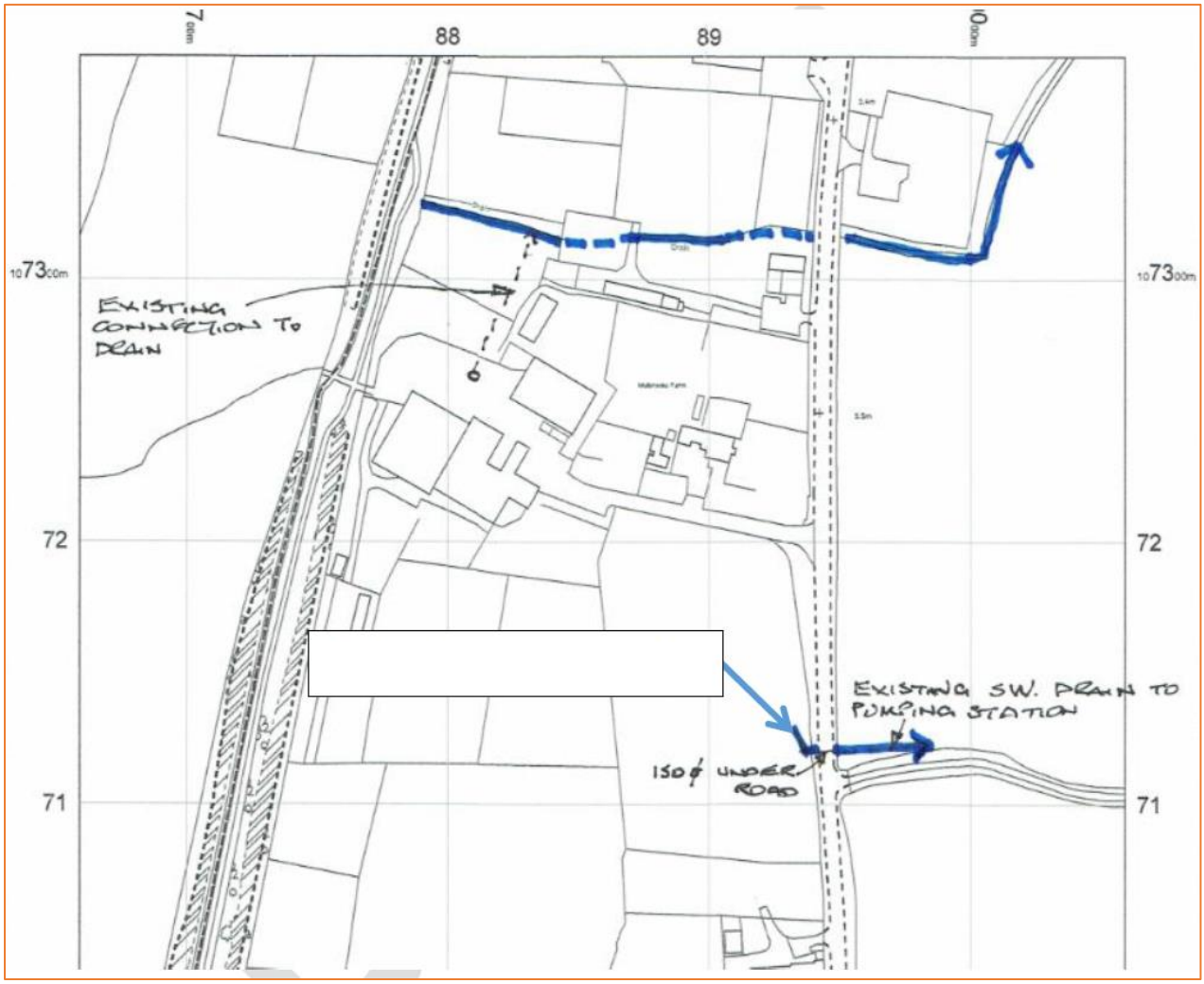


Figure 8: Existing Drainage Arrangement (Source: Ambiental)

2.22. A second discharge point has been identified some 90m south east of the site. Water is reported to flow through a 150mm diameter sewer, beneath Ersham Road, before being pumped up to Marland Sewer.

2.23. Asset records have also been obtained from Thames Water Ltd. These indicate the presence of only one public sewer within vicinity to the site.

2.24. According to the records provided, a public rising main sewer flows beneath the Cuckoo Trail adjacent west of the site.

2.25. Thames Water have confirmed, in consultation letter PLAN-018980, that the rising main is not suitable for connection of foul (gravity) sewers. As such an alternative means of surface water and foul discharge will need to be established.

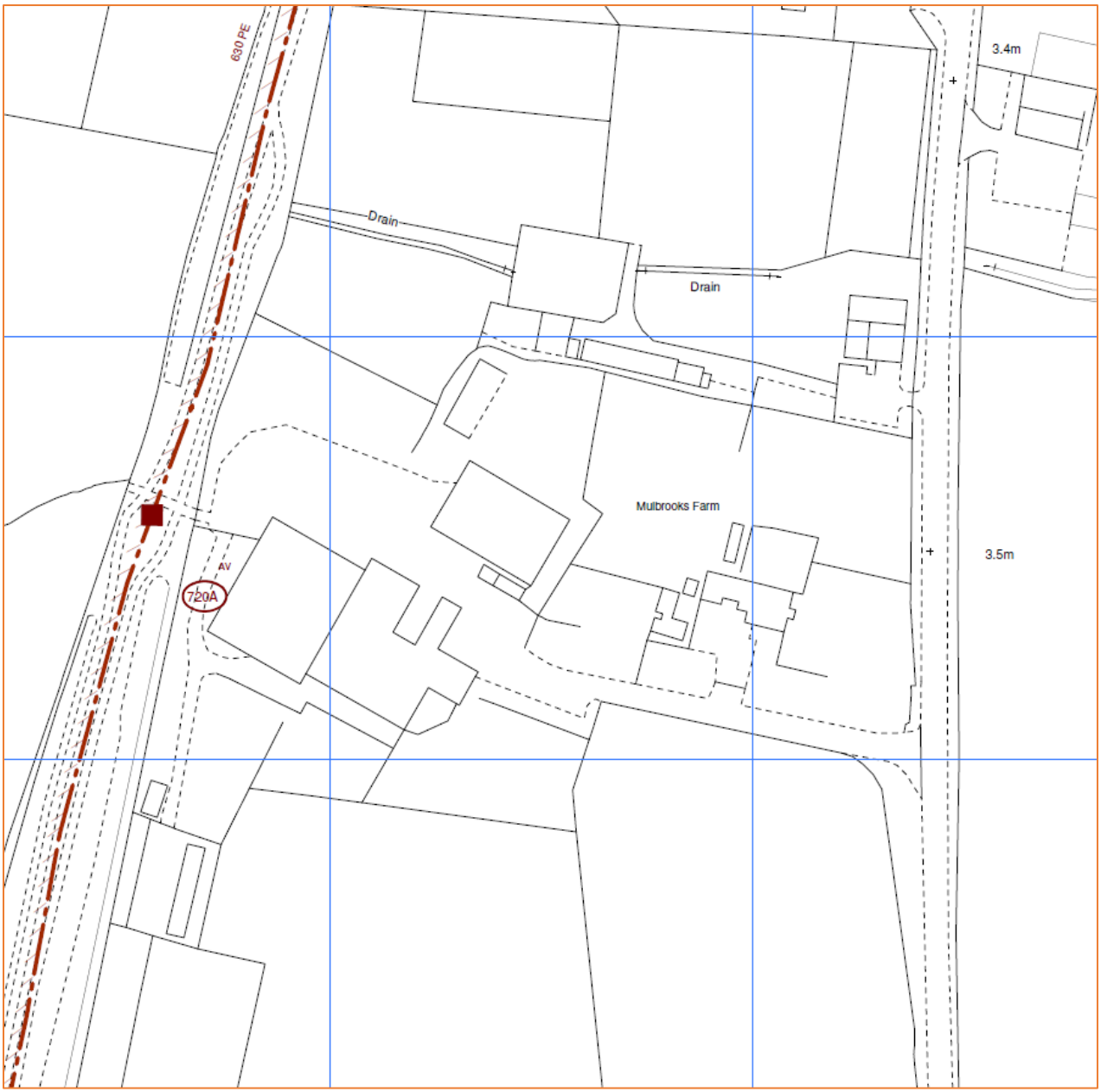


Figure 9: Asset Location Search (Source: Southern Water Ltd)

2.26. Given the site's current use, and the information provided by the client and Southern Water Ltd, surface water generated within the existing site boundary is likely to currently discharge at an uncontrolled rate via overland/subsurface flow into the drainage channels to the north and south east.

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. Post development the total roof area of the new residential dwellings and carports will cover approximately 2240m².

3.2. However, it is worth noting that the proposed plans include demolition of a number of existing buildings and incorporation of some of the existing hardstanding within the residential housing scheme, amounting to approximately 4110m².

3.3. Despite this, attenuation sizing within the strategy has been based on all newly introduced impermeable surfacing (6441m²), comprising both post development roof area and hardstanding. Thus significant betterment will be provided post development.

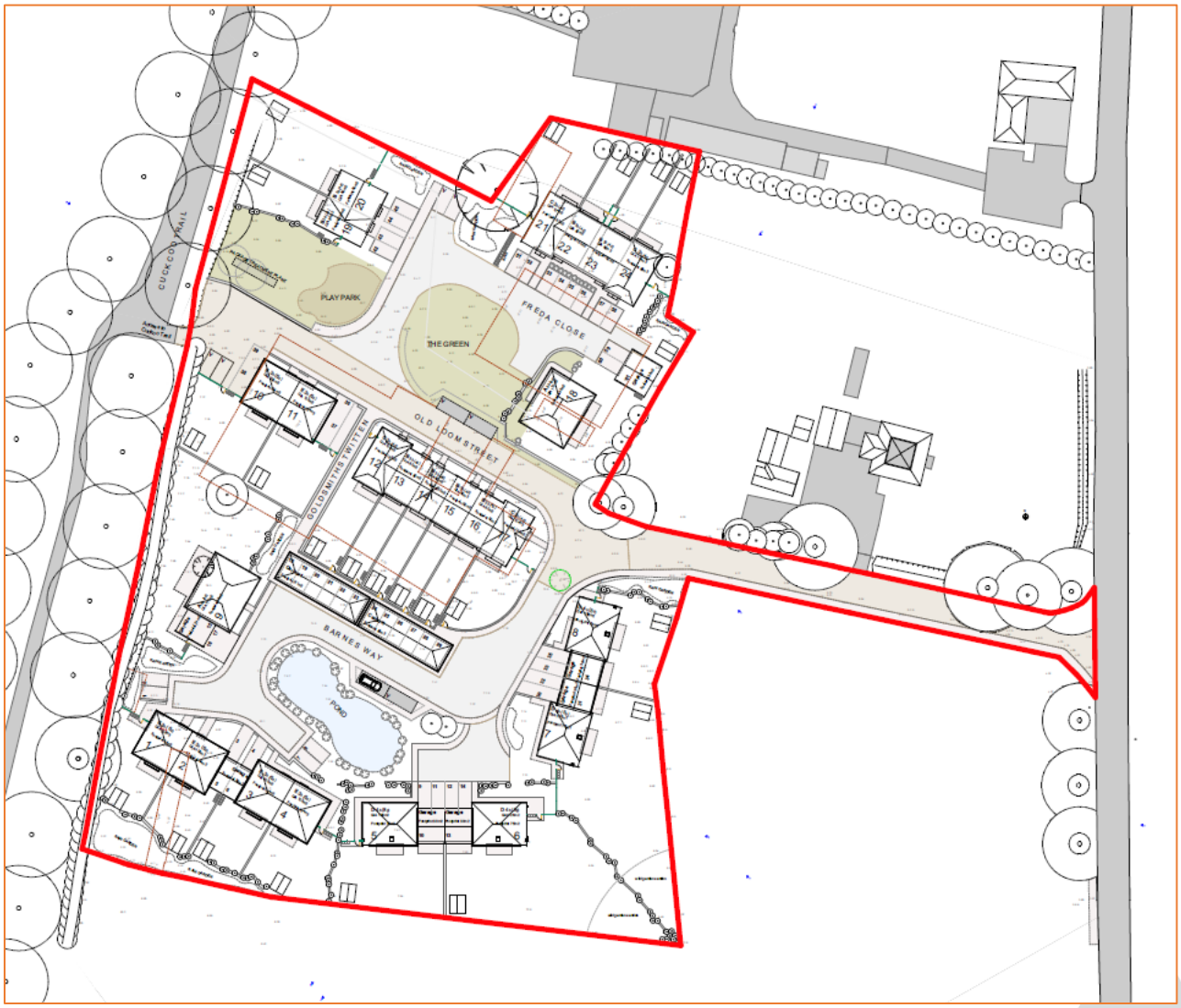


Figure 10: Proposed Site Layout Plan (Source: Ecotecture)

4. Surface Water Drainage Strategy:

4.1. In order to mitigate flood risk posed by post development runoff, adequate control measures will need to be considered within the site. This will ensure that surface water runoff is dealt with at source and flood risk is not increased elsewhere.

Drainage Hierarchy:

4.2. The drainage strategy for the site has been prepared according to the drainage discharge hierarchy from CIRIA C753 The Suds Manual, as follows:

- Infiltration to the maximum extent that is practical;
- Discharge to surface waters;
- Discharge to surface water sewer.

Infiltration Potential:
Refer to appendix for site investigation.

4.3. The 1:50,000 BGS map shows the site to be located directly upon the bedrock of Weald Clay Formation – Mudstone. The soil type taken from the BGS UKSO Soil Map Viewer, shows a soil parent material of Deep Claystone/Mudstone with a soil texture of Clay to Clayey Loam.

4.4. Despite being reportedly underlain by Weald Clay Formation infiltration testing has been undertaken at the site.

4.5. An intrusive site investigation was undertaken by Southern Testing in June 2020 and a factual soakage test report issued on 8th July 2020. Given the size of the site, a total of four trial pits were excavated throughout the proposed development area to varying depths of between 2.8m and 3.0mbgl (refer to TP1 – TP4 on location plan in soakage report appendix).

4.6. Typically, a minimum soakage rate of 0.1 l/m^2/min is required for conventional soakaways to meet the BRE365 requirement of a soakaway half empty time of less than 24 hours. Results from all four pits failed to meet this value, and the tests did not complete the necessary drop in level (25% full) to calculate a compliant value.

4.7. Given the results from in-situ infiltration testing in June 2020, the site is not considered suitable for infiltration drainage, and an attenuation based drainage strategy is proposed.

Discharge Location:

4.8. There are no open watercourses at the site, or along the red outline boundary.

4.9. Based upon information provided by the client, surface water generated within the existing site boundary is likely to currently discharge at an uncontrolled rate via overland/subsurface flow into either the drainage channel in the north or to the south east.

4.10. Having reviewed both pre-existing discharge options, whilst the preferred discharge location in the original drainage strategy was to the south east, given the site's natural gradient is considered most appropriate to utilise the existing piped connection in the north.

4.11. 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:

4.12. 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.

4.13. However, the existing site is brownfield and covered by approximately 5483m^2 of impermeable surfacing, comprising the existing built footprint and hardstanding. The existing site is therefore approximately 37% impermeable surfaces. Runoff rates for the

existing site (including the 37% impermeable coverage) have been calculated using MicroDrainage as 10.8 l/s for the 1:1 annual runoff event, 24.9 l/s for the 1:30 year event and 31.3 l/s for the 1:100 year event. Refer to calculations in appendix.

4.14. Runoff from proposed roof areas and hardstanding will be managed via a number of separate SuDS systems. However, from all SuDS features surface water flows will be directed in a controlled manner towards the north of the site. From here, water will be gradually discharged, via the existing piped connection, to the open watercourse some 35m north of the red outline boundary.

4.15. Outflow from the proposed SuDS systems will be managed via a number of separate hydrobrake flow controls. The cumulative rate of discharge from all drainage systems to open watercourse will be limited to the agreed rate as stipulated within East Sussex County Council consultation response WD/2017/0839/MAO, dated 13th October 2017.

4.16. 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.*

4.17. In light of this, it is proposed to discharge post development runoff to watercourse at a maximum rate of 3.2l/s. It should be noted that the site is currently underlain by approximately 37% hardstanding and that the 1 in 1 year greenfield runoff rate is 6.4 l/s. Therefore by limiting post development runoff to 3.2l/s significant betterment will be provided when compared to the existing situation.

Proposed SuDS:

4.18. 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.

4.19. 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:

4.20. 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.

4.21. 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.

4.22. 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.

4.23. 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.

4.24. 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).

4.25. 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.

4.26. 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.

4.27. 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.

4.28. Refer to enclosed calculations and Plan 89594-01 [*Proposed Drainage Layout*].

4.29. All preliminary surface water drainage calculations have been undertaken using MicroDrainage software. Refer to the appendix.

Raingardens (Bioretention):

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

4.31. 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.

4.32. 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.

4.33. 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.

4.34. 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.

4.35. 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.

4.36. 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.

4.37. 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.

4.38. 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.

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

4.40. 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.

4.41. 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.

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

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

Pond (Attenuation Basin):

4.44. 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.

4.45. 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.

4.46. 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.

4.47. 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.

4.48. 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.

4.49. 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.

4.50. 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.

4.51. 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.

4.52. 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.

4.53. Refer to enclosed calculations and Plan 89594-01 [*Proposed Drainage Layout*].

4.54. All preliminary surface water drainage calculations have been undertaken using MicroDrainage software. Refer to the appendix.

Attenuation Storage:

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

4.56. 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.

4.57. 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.

4.58. 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.

4.59. 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.

4.60. 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.

4.61. 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.

4.62. All preliminary surface water drainage calculations have been undertaken using MicroDrainage software. Refer to the appendix.

Water Quality:

4.63. Water quality has been assessed in line with the Simple Index approach from Chapter 26 of CIRIA C753 The SuDS Manual:

Step 1 – Allocate suitable pollution hazard indices for the proposed land use.
Step 2 – Select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index.

4.64. 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)

4.65. 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 attenuation basins are show in Table 2 below.

Total suspended solids (TSS)	Metals	Hydrocarbons
0.25	0.25	0.3

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

4.66. 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 to ground.

4.67. 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.

4.68. 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.

Design Exceedance:

4.69. Should the onsite drainage system fail under extreme rainfall events or blockage, flooding may occur within the site. In the event of the drainage system failure, the runoff flow can be managed through detailing the new external levels to direct water away from structures.

Adoption and Maintenance:

4.70. It is proposed that all SuDS facilities, including the Hydro-Brake flow control device, will be maintained privately by the end user.

4.71. A draft Maintenance Schedule is outlined in the Table below.

Tanked Permeable Paving

4.72. Permeable surfaces need to be regularly cleaned of silt and other sediments to preserve their infiltration capability. A brush and suction cleaner, which can be a lorry-mounted device or a smaller precinct sweeper, should be used and the sweeping regime should be as follows:

1. End of winter (April) – to collect winter debris.
2. Mid-summer (July/August) – to collect dust, flower and grass-type deposits.
3. After autumn leaf fall (November).

4.73. If reconstruction is necessary, the following procedure should be followed:

1. Lift surface layer and laying course.
2. Remove any geotextile filter layer.
3. Inspect sub-base and remove, wash and replace if required.
4. Renew any geotextile layer.
5. Renew laying course, jointing material and concrete block paving.

4.74. Materials removed from the voids or the layers below the surface of the paving may contain hazardous substances such as heavy metals and hydrocarbons which may need to be disposed of as controlled waste.

Cellular Storage:

4.75. It is not envisaged that silt build up within the cellular crate systems will require a rigorous maintenance regime so long as silt is removed from upstream catch pits and inspection chambers on a regular basis. Notwithstanding this, a suitable maintenance regime for the systems will comprise of routine inspection and silt removal (as necessary). Inspection should be undertaken using CCTV equipment offered up the inspection tunnels located within the crate system. Camera access can be gained via inspection chambers and inlet pipework located at each end of the tunnels.

4.76. Silt removal can be achieved by jetting the inspection tunnels. Jetting should be undertaken in accordance with current jetting guidelines, in particular the Code of Practice for Sewer Jetting published by The Water Research Centre. Jetting at 150bar at 300l/min should be more than adequate in removing any build-up of material within the tunnel. The crate system will take higher pressures. However, unlike regular jetting which relies heavily on high pressure to remove hardened deposits on the inner bore of pipes, effective cleansing of a crate system relies more on the delivery flow rate to flush solids back through the system.

4.77. A standard jet head with rear facing nozzles should be used. The head should be fed to the far end of the crate tunnel via the nearest inspection chamber, activated and retracted. As the nozzle is removed, debris will be swept back into the inspection chamber where it can then be removed with the use of a standard gully sucker. This method will ensure the effective removal of gross solids (carrier bags, cans, leaf litter etc.) from the system. Whilst 100% removal cannot be guaranteed, it has been shown that this jetting method will also remove an element of finer material which would otherwise be 'lost' within the system.

Proposed Surface Water Drainage Pipework and Catchpits

4.78. It is not envisaged that silt build up within the pipework systems will require a rigorous maintenance regime so long as silt is removed from upstream catch pits on a regular basis. A suitable maintenance regime for the systems will comprise of routine inspection (every six months) and silt removal (as necessary).

Flow Controls

4.79. Hydro-Brakes or other flow control devices should be inspected for blockages every 6 months, and debris removed as necessary.

Drainage Element	Maintenance Requirement	Frequency
Gutters & downpipes	▪ Inspect and remove silt/ debris	▪ To be inspected every three months and silt/ debris removed as necessary.
Inspection Chambers and Catch Pits and Flow Controls	▪ Inspect and remove silt	▪ To be inspected every three months and silt/ debris removed as necessary. Flow control to be checked for blockages.
Tanked Permeable Paving	▪ Sweeping/vacuuming to remove build-up of silt or other sediments	▪ Three times a year or as necessary
	▪ Removal of weeds ▪ Replacement of cracked paving blocks ▪ Remedial work to cracks and depressions	▪ As required
Cellular Storage	▪ Inspect and remove debris	▪ CCTCV inspection following first storm event. Monthly CCTV inspections for first 3 months. 6 monthly CCTV inspections thereafter. Jetting to remove silt as necessary.

Table 3: Suggested Maintenance Regime for Elements of the Drainage Infrastructure

Note: In addition to the above maintenance requirements, it is recommended that all drainage elements are inspected:
- Following the first storm event;
- Monthly for the first 3 months following commissioning.

Raingardens (Bioretention):

4.80. Two raingardens are proposed at the site, post development.

4.81. Dalrymple (2013) concluded that bioretention systems will typically require approximately 2.5 times more maintenance than typical landscape designs. The two on-site bioretention systems will require regular maintenance to ensure continuing operation to design performance standards.

4.82. The main cause of failure of bioretention systems is clogging of the surface, which is easily visible. Underdrains and drainage layers are beneath the ground, and malfunctioning is not so easy to detect therefore could potentially be ignored. However, the results of any malfunctioning are likely to cause surface ponding. The clogging of the surface or drainage layers can cause poor outflow water quality due to water bypassing the filter medium to the overflow more frequently than allowed for. During the first few months after installation, the two systems should be visually inspected by the Estates Department after rainfall events, and the amount of deposition measured, to give the groundsmen an idea of the expected rate of sediment deposition. After this initial period, systems should be inspected each quarter, to verify the appropriate level of maintenance.

Maintenance Schedule	Required Action	Frequency
Regular Inspection	Inspection of the infiltration surfaces of both raingardens for silting and ponding. Record de-watering time of each raingarden and assess the standing water levels in the underdrain to determine whether maintenance is necessary.	Quarterly.
	Check operation of underdrains by inspection of flows after a rainfall event.	Annually.
	Assess vegetation for disease infection, poor growth, and invasive species. Replace where necessary.	Quarterly.
	Inspect inlets and outlets for blockage.	Quarterly.
Regular Maintenance	Remove litter, debris and weeds from the surface of the bioretention units.	Quarterly. Can be undertaken more frequently if littering of the gardens are an issue.
	Replace plants to maintain vegetation density.	As required.
	Remove sediment, litter and debris build up from around the inlets.	Typically undertaken quarterly however, this could be undertaken more frequently whilst sweeping the footpaths and roads.
Occasional Maintenance	Infill any holes or scour within the filter medium. Improve erosion protection if required by way of increasing plant density or installing rocks at bioretention inlet to reduce water energy.	As required.
	Repair minor accumulations of silt by raking away surface mulch, scarifying surface medium and replacing mulch.	As required.
Remedial Actions	Remove and replace filter medium/vegetation coverage.	As required but likely to be within > 20 years.

Table 4: Operation and Maintenance Requirements for Bioretention Systems

Attenuation Basin

4.83. It is not anticipated that the attenuation basin will require a rigorous maintenance regime as long as silt is removed on a regular basis. A suitable maintenance regime for the attenuation basin would be as follows:

1. Monthly – removal of litter, mowing grass & check outlet for blockages.
2. Annually – sediment removal and tidy dead plant growth.
3. As required – repair inlets and outlets and reinstate design levels. Refer to Table 5, below

Maintenance Schedule	Required Actions	Frequency
Regular maintenance	Remove litter and debris	Monthly, or as required
	Cut grass – landscaped areas and access routes	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly, at start, then as requested
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	Annually or as required
	Prune and trim trees and remove cuttings	As required
	Remove sediment from pre-treatment system when 50% full	As required
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Repair or rehabilitate inlets and outlets	As required
Monitoring	Inspect inlets, outlets and overflows for blockages and clear if required.	Monthly
	Inspect bank slopes, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and pre-treatment systems of silt accumulation; establish appropriate silt removal frequencies	Half Yearly

Table 5: Attenuation Basin Maintenance Requirements

5. Proposed Foul Drainage:

Existing Foul Drainage:

5.1. The existing site is already served by a private treatment plant with a discharge to local watercourse. However, this plant will not be suitable to serve the new development (from EA letter to client).

Public Foul Sewer Network:

5.2. Asset records obtained from Thames Water indicate that there is one public sewer within the vicinity of the site. Thames water have confirmed, in consultation letter PLAN-018980, that the rising main is not suitable for connection of foul (gravity) sewers.

Foul Drainage Hierarchy:

5.3. There are no foul public sewers within the vicinity of the area to make a viable connection to.

5.4. There is sufficient space within the site layout to accommodate a suitable sized package sewage plant.

5.5. It is anticipated that the foul runoff from the proposed development will be discharged to a suitably sized private sewage treatment plant located in the north western corner of the site (see Proposed Drainage Layout in Appendix D).

5.6. Infiltration of the treated effluent is not possible due to the weld clay bedrock geology. From the size of the development, it is estimated that approximately 132 people will live at the site. The size of a sewage treatment plant is calculated using the flow (180 litres per person per day) and BOD (biochemical oxygen demand) (60 grams per person per day). For this site that equates to 23.76m^3 of flow and 7.92kg of BOD.

5.7. As such, it is proposed to discharge treated effluent from the sewage treatment plant to the same outflow as the SuDS features to the north of the site. This will then discharge into a drainage ditch, 35m north of the site.

Adoption and Maintenance:

5.8. The private sewage treatment plant will be privately owned and maintained.

5.9. The private sewage treatment plant will be maintained in accordance with the manufacture and suppliers specification.

Treatment of Effluent:

5.10. Incoming sewage will be screened to prevent non-degradable products entering the digestion chamber. The screened sewage will be aerated and a microbial 'soup' developed that digests the pollutants and organic matter in the sewage. The beneficial microbes are constantly topped up with the microbes that settle out at the bottom of the final settlement tank, ensuring a constant supply of bacteria for the digestion process.

5.11. The treated sewage then enters the final settlement chamber where activated sludge bacteria settle out at the bottom. These beneficial microbes are constantly returned to the digestion chamber to boost the treatment system performance.

5.12. Discharge to watercourses and ditches is accepted by the Environment Agency, without the need for a permit, if the installation complies with the General and Binding Environment Agency Rules.

6. Discussion and Conclusions:

6.1. This Surface Water and Foul Drainage Technical Note has been prepared by Unda Consulting Limited on behalf of Aitco Ltd, to address pre-commencement Conditions 9, 10, 11 and 12.

6.2. The site is occupied by a former mill and is approximately 14631m^2 in size. The site is comprised of a number of buildings and is currently utilised by a collection of craft shops and stalls including a tea room. The existing buildings are predominantly located in the centre west and north of the site with vacant land to the south. According to plans provided by the client, the main area of the site is accessed via a two-way tarmacked road off the B2104 adjacent east. Google imagery indicates that the proposed development area, in the west of the site, is already largely underlain by hardstanding.

6.3. According to available information the site is currently underlain by approximately 5483m^2 of hardstanding comprising 2342m^2 of built footprint and 3141m^2 of concrete. As such, the existing site is considered to be formed of approximately 37% impermeable surfaces.

6.4. 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.

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

6.6. 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.

6.7. The proposed planning application is for redevelopment of the site with construction of twenty four new residential dwellings, with associated access road and parking. Post development the total roof area of the new residential dwellings and carports will cover approximately 2240m^2.

6.8. However, it is worth noting that the proposed plans include demolition of a number of existing buildings and incorporation of some of the existing hardstanding within the residential housing scheme, amounting to approximately 4110m^2.

6.9. Despite this, 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.

6.10. The 1:50,000 BGS map shows the site to be located directly upon the bedrock of Weald Clay Formation – Mudstone. The soil type taken from the BGS UKSO Soil Map Viewer, shows a soil parent material of Deep Claystone/Mudstone with a soil texture of Clay to Clayey Loam.

6.11. The published Environment Agency Groundwater Vulnerability map shows the site is not located within an area classified as a Groundwater Source Protection Zone.

6.12. There are no existing watercourses or rivers at the site or along the application boundary.

6.13. According to information provided by the client the nearest watercourse to the site is an unnamed open channel some 35m north. It is reported that current building operations discharge into this watercourse via an existing piped service connection.

6.14. Asset records have also been obtained from Thames Water Ltd. These indicate the presence of only one public sewer within vicinity to the site.

6.15. According to the records provided, a public rising main sewer flows beneath the Cuckoo Trail adjacent west of the site. Thames Water have confirmed, in consultation letter PLAN-018980, that the rising main is not suitable for connection of foul (gravity) sewers. As such an alternative means of surface water and foul discharge will need to be established.

Surface Water Drainage Strategy Discussion

6.16. The 1:50,000 BGS map shows the site to be located directly upon the bedrock of Weald Clay Formation – Mudstone. The soil type taken from the BGS UKSO Soil Map Viewer, shows a soil parent material of Deep Claystone/Mudstone with a soil texture of Clay to Clayey Loam.

6.17. Despite being reportedly underlain by Weald Clay Formation infiltration testing has been undertaken at the site.

6.18. An intrusive site investigation was undertaken by Southern Testing in June 2020 and a factual soakage test report issued on 8th July 2020. Given the size of the site, a total of four trial pits were excavated throughout the proposed development area to varying depths of between 2.8m and 3.0mbgl (refer to TP1 – TP4 on location plan in soakage report appendix).

6.19. Typically, a minimum soakage rate of 0.1 l/m²/min is required for conventional soakaways to meet the BRE365 requirement of a soakaway half empty time of less than 24 hours. Results from all four pits failed to meet this value, and the tests did not complete the necessary drop in level (25% full) to calculate a compliant value.

6.20. Given the results from in-situ infiltration testing in June 2020, the site is not considered suitable for infiltration drainage, and an attenuation based drainage strategy is proposed.

6.21. Based upon information provided by the client, surface water generated within the existing site boundary is likely to currently discharge at an uncontrolled rate via overland/subsurface flow into either the drainage channel in the north or to the south east.

6.22. Having reviewed both pre-existing discharge options, whilst the preferred discharge location in the original drainage strategy was to the south east, given the site's natural gradient is considered most appropriate to utilise the existing piped connection in the north.

6.23. 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.

6.24. 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.

6.25. However, the existing site is brownfield and covered by approximately 5483m² of impermeable surfacing, comprising the existing built footprint and hardstanding. The existing site is therefore approximately 37% impermeable surfaces. Runoff rates for the existing site (including the 37% impermeable coverage) have been calculated using MicroDrainage as 10.8 l/s for the 1:1 annual runoff event, 24.9 l/s for the 1:30 year event and 31.3 l/s for the 1:100 year event. Refer to calculations in appendix.

6.26. Runoff from proposed roof areas and hardstanding will be managed via a number of separate SuDS systems. However, from all SuDS features surface water flows will be directed in a controlled manner towards the north of the site. From here, water will be gradually discharged, via the existing piped connection, to the open watercourse some 35m north of the red outline boundary.

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

6.28. 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				

6.29. Refer to pages 12 to 15 for further information regarding the individual SuDS sizing.

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

6.31. 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.

6.32. 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.

6.33. Should the onsite drainage system fail under extreme rainfall events or blockage, flooding may occur within the site. In the event of the drainage system failure, the runoff flow can be managed through detailing the new external levels to direct water away from structures.

Foul Drainage Strategy Discussion

6.34. There are no foul public sewers within the vicinity of the area to make a viable connection to.

6.35. There is sufficient space within the site layout to accommodate a suitable sized package sewage plant.

6.36. It is anticipated that the foul runoff from the proposed development will be discharged to a suitably sized private sewage treatment plant located in the north western corner of the site (see Proposed Drainage Layout in Appendix D).

6.37. Infiltration of the treated effluent is not possible due to the weld clay bedrock geology. From the size of the development, it is estimated that approximately 132 people will live at the site. The size of a sewage treatment plant is calculated using the flow (180 litres per person per day) and BOD (biochemical oxygen demand) (60 grams per person per day). For this site that equates to 23.76m^3 of flow and 7.92kg of BOD.

6.38. As such, it is proposed to discharge treated effluent from the sewage treatment plant to the same outflow as the SuDS features to the north of the site. This will then discharge into a drainage ditch, 35m north of the site.

6.39. 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

August 2020

7. Appendix

A - Proposed Plans and Design & Access Statement:

- Site Location Plan - Ecotecture;
- Proposed Site Plan - Ecotecture;
- Design and Access Statement – Ecotecture.

B – Consultee Responses:

- Environment Agency Consultation Response (HA/2017/119589/01-L01);
- Wealden District Council Consultation Response (GK/LV8000);
- East Sussex County Council Consultation Response (WD/2017/0839/MAO);
- Southern Water Consultation Response (PLAN-018980).

C - MicroDrainage Calculations:

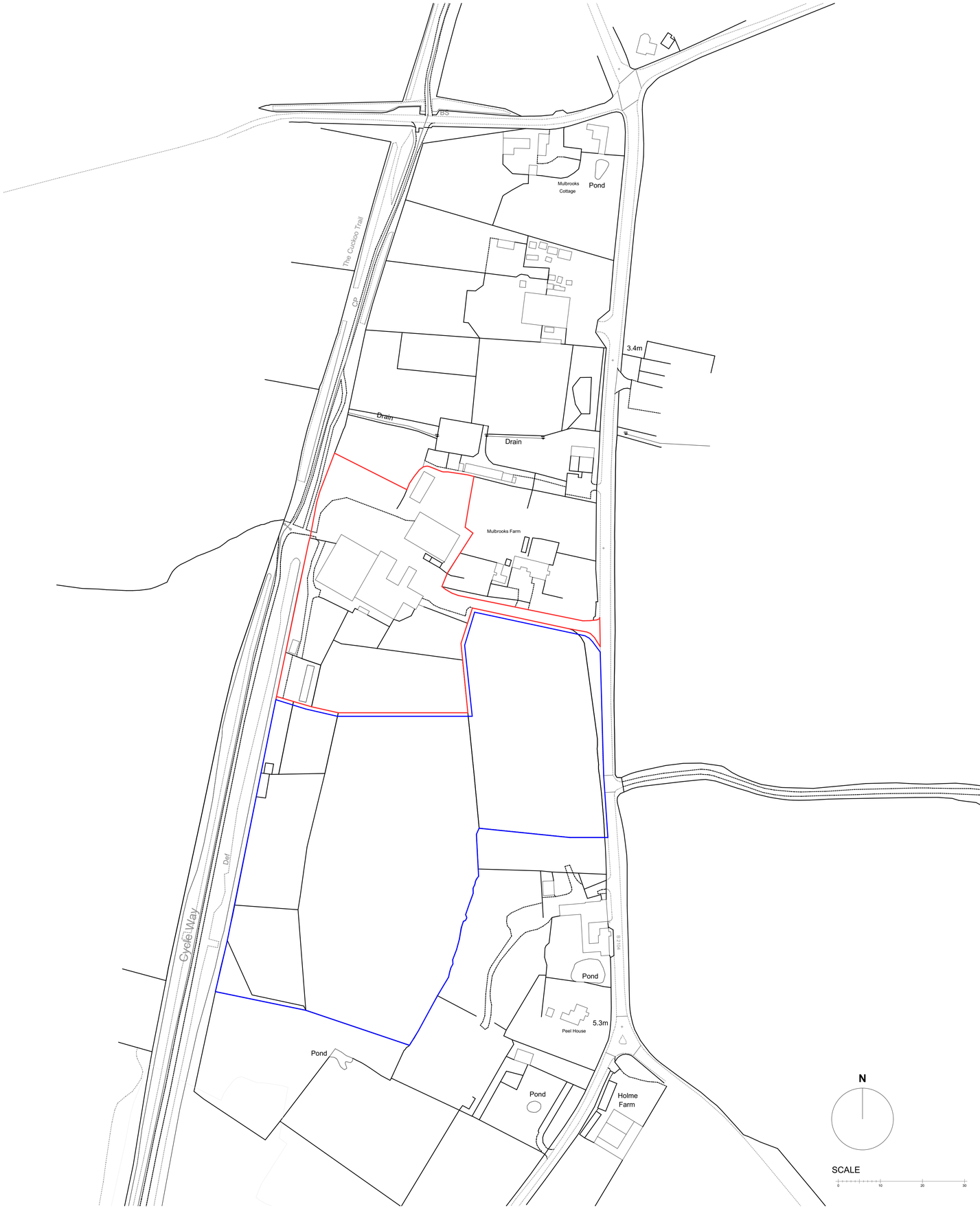
- ICP SUDS Rural Runoff Calculations;
- ICP SUDS Urban Runoff Calculations;
- Tanked Permeable Paving and Hydro-Brake Calculations;
- Rain Garden Cascade;
- Pond Sizing and Hydro-Brake Calculations;
- Attenuation Storage and Hydro-Brake Calculations.

D - Drainage Layout Plans:

- Proposed Drainage Layout [89594-01];

E – Information by Others:

- Infiltration Test Results – Southern Testing Ltd.



Notes

Do not scale off this drawing except for planning purposes

Check all dimensions on site before any work commences

All goods, materials and workmanship must conform to current building regulations, british standards and codes of practice.

Drawing to be printed A1

RevID	Issued By	Date	Layout Comment
A		21/05/20	red line added to site plan

ecotecture
ECOLOGICAL ARCHITECTURE

01444 416745
info@ecotecture.co.uk
www.ecotecture.co.uk

31 Sussex Road
West Sussex
Haywards Heath
RH16 4DZ

Client: AITCO Ltd

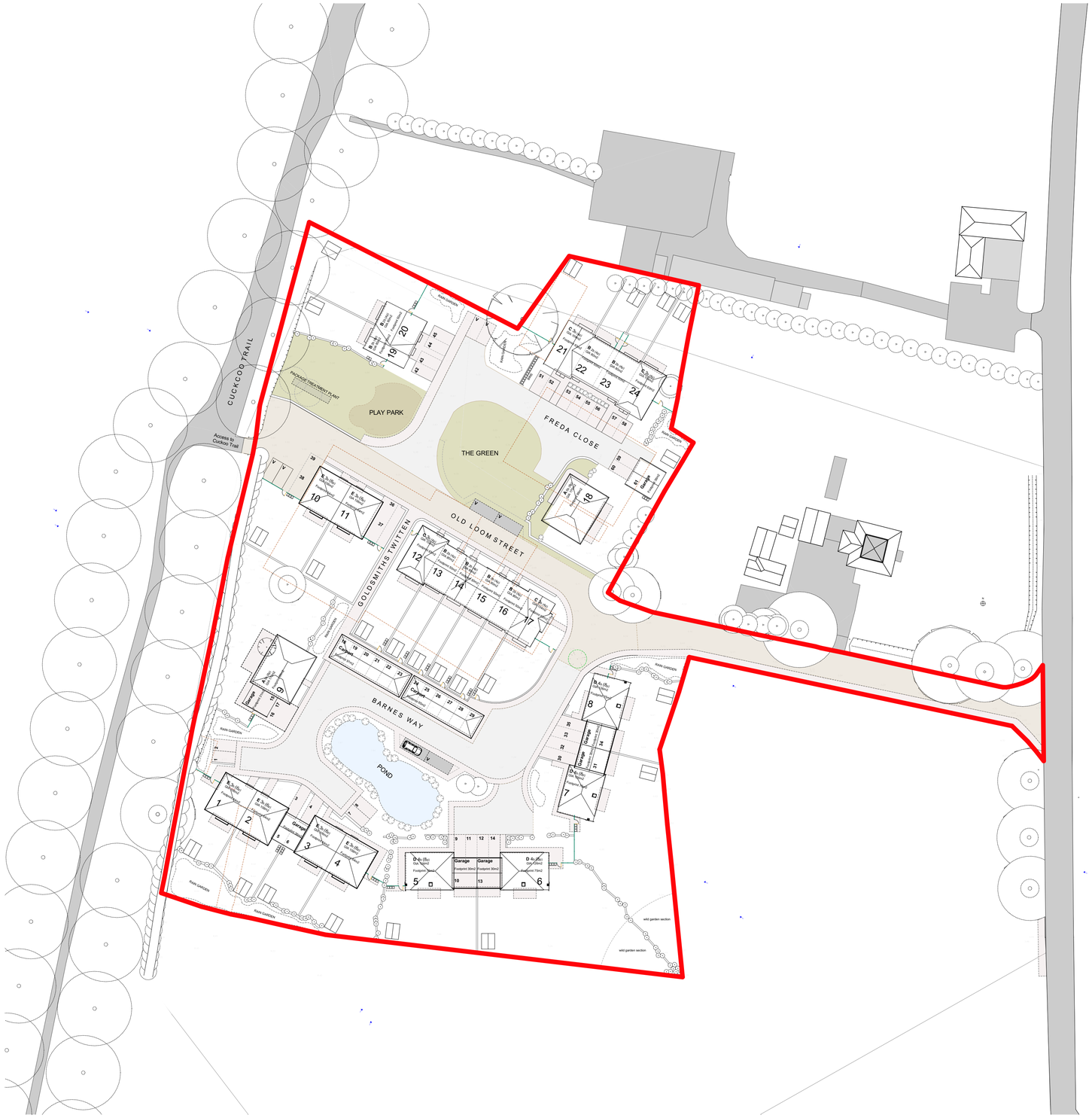
Address: Old Loom Mill
Earsham Road
Hailsham
BN27 2RH

Description: LOCATION PLAN

Scale: 1:1250, 1:500 Date:

Drawn: CH Checked: JS

Drawing No: 689 /PL_001_A



Site Plan

0m 5m 10m 15m 20m 25m

N

Notes

Do not scale off this drawing except for planning purposes

Check all dimensions on site before any work commences

All goods, materials and workmanship must conform to current building regulations, british standards and codes of practice.

Drawing to be printed A1

The red line has been drawn based on information provided by the client, the red line on this drawing should not form part of any sales or legal documentation, please always refer to the title deeds.

Areas Old Loom Mill

	Number of bedrooms	National Space Standard	Actual GIA m2	Storage area m2	Total units	Footprint m2	Total GIA	Total Footprint	
House Type A	5b (8p)	128	170	3.5	2	99	340	198	m2
House Type B	2b (4p)	79	80	2	6	50	480	300	m2
House Type C	3b (6p)	102	104	2.5	4	63	416	252	m2
House Type D	4b (8p)	124	126	3	4	75	504	300	m2
House Type E	3b (6p)	102	106	3	8	64	848	512	m2
							2588	**1562**	**m2**

Schedule of Accomodation

RevID	Issued By	Issue Date	Layout Comment

ecotecture
ECOLOGICAL ARCHITECTURE
01444 416745 info@ecotecture.co.uk
www.ecotecture.co.uk
31 Sussex Road Haywards Heath
West Sussex RH16 4DZ

Client: AITCO Ltd

Address: Old Loom Mill
Earsham Road
Hailsham
BN27 2RH

Description: Proposed Site Plan

Scale: 1:500, 1:1 Date: Jun' 19
Drawn: CH Checked: JS

Drawing No: 689/100

Our ref: HA/2017/119589/01-L01
Your ref: WD/2017/0839/MAO

Date: 25 July 2017

Wealden District Council
Development Control
Vicarage Lane
Hailsham
East Sussex
BN27 2AX

Dear Sir/Madam

DEMOLITION OF EXISTING BUILDINGS IN B1/B8 USAGE AND CAFE AND ERECTION OF 24 NO. FAMILY HOUSES.

OLD LOOM MILL (TEA ROOM) ERSHAM ROAD, HAILSHAM, EAST SUSSEX, BN27 2RH.

Thank you for the consultation on the above application, please quote our reference on all correspondence.

Environment Agency Position

With regards to the foul drainage proposals, there are no objections, in principal, to the use of a private treatment plant.

Although there is a main public sewer running past the site, this is the rising main that pumps sewage from Polegate to the Hailsham works. It will not be possible to connect the development to this rising main and the nearest suitable public sewer is beyond an acceptable distance for a connection to be made.

The existing café and units are already serviced by a private treatment plant with a discharge to the local watercourse. This plant will not be suitable to serve the new development.

The applicant should be advised that a permit will be required for this proposal, because the proposed plant will discharge into the Pevensey Levels SSSI, any environmental permit is likely to be subject to stringent discharge standards and there is no guarantee that one would be issued.

Yours faithfully

Miss Suz Greenwood
Planning Advisor, Environment Agency

Direct dial 02084745098
Direct fax
Direct e-mail suz.greenwood@environment-agency.gov.uk

End

My reference GK/LV8000

ask for Graham Kean

date 22 August 2017

Wealden District Council
Council Offices, Vicarage Lane
Hailsham
East Sussex BN27 2AX

website : www.wealden.gov.uk

MEMORANDUM

Mr C Bending, Planning

your reference

Planning Application WD/2017/0839/MAO
The Old Loom Mill, Ersham Road, Hailsham

I write further to your memorandum of 4 July 2017 and your subsequent e-mail of 28 September 2017 regarding the above planning application and I would have the following comments.

The whole of the site lies within EA Flood Zone 1. The site does not appear to be at risk from general tidal or sea flooding provided the man-made sea defences at Eastbourne and Pevensey Bay are maintained. The site does not appear to be at risk from failure of a drainage asset such as a canal or reservoir. There is a low possibility of fluvial flooding from the watercourse north of the application site. There is a possibility of surface water or groundwater flooding. There are no ponds or watercourses within the application site. There is an ordinary watercourse running west to east just north of the application site. East of Ersham Road, this eventually discharges via a pumping station into the Saltmarsh Sewer main river. The area to the east of Ersham Road is controlled by the Pevensey and Cuckmere Water Level Management Board. There are ongoing problems with flows and clearance of the ordinary watercourse to the north of the application site.

The Geological Map states that the site is on the Weald Clay Formation of mudstones.

There are no existing, adopted, dedicated, surface water sewers within the vicinity of the application site.

As infiltration is the first recommended drainage method in the SUDS hierarchy, this method requires consideration. However, given the nature of the geology and the presence of watercourses on the surface in the vicinity of the application site, it is unlikely that this method would work.

The outline surface water drainage layout is given at Appendix 4. It shows surface water running into areas of permeable paving to be used as storage. Given the underlying geology, little or any water is likely to drain into the subsoil, so the permeable paving has perforated land drains at the bottom of the formation which are then drained to a storage pond in the south-east corner of the application site.

On the plan at Appendix 4 the final outlet from this pond is shown running north to the entrance road to discharge, whilst on the plan at figure 3 the discharge point is shown as an existing culvert (presumably owned by ESCC, therefore) under Ersham Road to the south-east of the site (although the point of connection is still within the applicant's land). I would obviously require more clarity as to which option is to be used.

The depth and to a lesser extent the size of the any storage device will be influenced by the actual ground conditions encountered on site. I would therefore like to see the a site investigation which incorporates site specific test pits and ground water monitoring, preferably in winter, to establish what depth of storage is practical and whether such features will have to be lined to prevent groundwater infiltration. Any unlined feature should achieve a 1.0 metre vertical separation between the groundwater levels and the base of the feature.

In considering the drainage principles proposed for the site, the Lead Local Flood Authority, ESCC, will require full detail in the drainage calculations used to design the system and Wealden, as the planning authority, would support this request. The calculations should prove that the final design can accommodate the site runoff rates for the standard 1 in 100 year rainfall event plus 40% climate change allowance plus urban creep. The calculations should also show that the culvert under Ersham Road immediately downstream of the application site and the following unclassified watercourse, into which it is proposed to discharge, are capable of taking the proposed flows.

I note that, although maintenance activities for the surface water drainage system are considered within paragraph 4.22, these are largely generic and must remain so until the final layout detail is provided. Experience elsewhere suggests that it is most unlikely that any local authority or utility company will adopt the new on-site surface water drainage system. Therefore it will be necessary for a residents' association/site management company to be set up by the site owner to manage and maintain the scheme (as this section makes clear) and the information eventually supplied to this body (which will probably be composed of non-technical persons) needs to reflect this. As much as possible of the system should be located within the public open areas and assured access will be obviously be required to those parts of the system which are within private ground.

The Council would not wish to see exceedance flows directed towards the Cuckoo Trail.

Over and above the obtaining of planning permission, it may be necessary to obtain a discharge consent for the final outlet from the Pevensey and Cuckmere Water Level Management Board.

Provision of foul sewage drainage is a matter for Southern Water to comment on, in particular, in view of the capacity problems within the Hailsham catchment. It should be noted that the foul sewer running south to north along the Cuckoo Trail is a pumped main and therefore cannot accommodate a connection from this application site.

Should you be minded to grant planning permission, the following **conditions** must be applied to be reflected in any full application/reserved matter/discharge of conditions and in any section 106 Agreement which may be entered into.-

No development shall take place until full details of the surface water drainage scheme, have been submitted to and approved in writing by the local planning authority. The surface water drainage scheme should be confirmed as deliverable by an assessment of the site's potential for disposing of surface water by means of a sustainable drainage system. The submitted details shall include the following:

i. Be supported by a site investigation which incorporates site specific test pits and ground water monitoring, preferably in winter, to establish the practical depth of any storage features, whether they will need to be lined and to ensure any unlined feature achieves a 1.0 metre vertical separation between the groundwater levels and the base of the feature.

ii. Supply hydraulic calculations to the correct level of climate change (40%) to the satisfaction of the Lead Local Flood Authority

iii. Provide a management and maintenance plan for the development which shall include the arrangements for the setting up of any necessary company/association to secure the operation of the scheme throughout its lifetime.

iv. Supply detailed plans, layouts and sections of the proposed drainage system, and construction details of any non-standard features and pollution control devices.

v. Provide sufficient information to confirm the outlet arrangements, to ensure that any permissions to connect are in place and to confirm the capacity and condition of the existing outlet watercourse.

NOTE: Attention should be given to non-statutory technical standards for sustainable drainage systems, the ESCC "Guide to Sustainable Drainage Systems in East Sussex" and the total costs of implementing the drainage scheme, that is design, construction and maintenance costs.

REASON: To reduce the risk of flooding, both on and off site, to improve and protect the water quality and improve habitat and amenity having regard to the guidance set out in the National Planning Practice Guidance and at paragraph 103 of the NPPF and any local plan policies where appropriate according to the local planning authority, for example WCS14 of CSLP, saved policy CS2 of the Wealden Local Plan.

Please contact Graham Kean on extension 3126 if you wish to discuss the matter further or to meet on site.

Graham Kean
Engineer and Countryside Officer

Communities Economy and Transport

Rupert Clubb
BEng(Hons) CEng MICE
Director

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www.eastsussex.gov.uk

Mr C Bending
Wealden District Council
Council Offices
Vicarage Lane
Hailsham
East Sussex

Date 13/10/2017

Dear Mr Bending

SUD/WD/2017/042 - DEMOLITION OF EXISTING BUILDINGS IN B1/B8 USAGE AND CAFE AND ERECTION OF 24 NO. FAMILY HOUSES.

Location: **THE OLD LOOM MILL, ERSHAM ROAD, HAILSHAM, BN27 2RH**

Planning Application Reference: **WD/2017/0839/MAO**

Received Date: **4 July 2017**

Position of the Lead Local Flood Authority:

No objection	The information provided is satisfactory and enables the LLFA to determine that the proposed development is capable of managing flood risk effectively.	
No objection	The information provided is satisfactory and enables the LLFA to determine that the proposed development is capable of managing flood risk effectively. Although there will be a need for standard conditions which are outlined in this response.	
No objection in principle subject to the imposition of conditions	Whilst the application documentation has not met all the County Council's requirements, it is possible that the risk is capable of being mitigated to acceptable levels by the application of planning conditions which are outlined in this response.	✓
Objection due to Insufficient Information	The applicant has failed to meet the requirements to assess its acceptability in flood risk terms. The LLFA will respond in 21 days of receipt of the requested information	
Objection	The application presents an unacceptable on site/off site flood risk.	

Cont./…

Detailed Comments:

Following our previous response dated 25 July 2017 and further information submitted by the applicant, which we received on 28 September 2017, this letter represents our updated comments on the above application.

We appreciate that this is an outline application and therefore the layout is only indicative and on this basis we do not wish to raise an objection to the principle of the proposed development on this site. However, we do not consider that the surface water drainage strategy should be progressed in its current form.

The Flood Risk Assessment identifies two options for the outfall for the surface water drainage network. 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.

The drainage strategy drawing is very approximate and we would expect a more detailed drainage strategy to be submitted when the development layout is being addressed. The detailed drainage strategy should demonstrate that sufficient attenuation can be provided within the site, and drained by gravity, to managed storm events up to and including the 1 in 100 year, including 40% climate change, event. It is also noted that the hydraulic calculations show approximately 26m^3 of flooding occurring within the site. This should be dealt with as part of the detailed drainage strategy or it should clearly be demonstrated that this flooding can be contained within the site without putting properties at risk.

If the Local Planning Authority is minded to grant planning permission, the LLFA requests the following comments should be addressed as part of the reserved matters application to ensure surface water runoff from the development is managed safely:

1. 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. Evidence of this (in the form hydraulic calculations) should be submitted with the detailed drainage drawings. The hydraulic calculations should take into account the connectivity of the different surface water drainage features.
2. The detailed design should include how surface water flows exceeding the capacity of the surface water drainage features will be managed safely. The surface water drainage design should show the route and details of the connection from the development site to the public Southern Water sewer or the watercourse if connection is directly to the watercourse.
3. A maintenance and management plan for the entire drainage system should be submitted to the planning authority before any construction commences on site. This plan should clearly state who will be responsible for managing all aspects of the surface water drainage system, including piped drains, and the appropriate authority should be satisfied with the

submitted details. Evidence that these responsibility arrangements will remain in place throughout the lifetime of the development should be provided to the Local Planning Authority.

4. The applicant should detail measures to manage flood risk, both on and off the site, during the construction phase. This may take the form of a standalone document or incorporated into the Construction Environment Management Plan for the development.
5. Prior to occupation of the development evidence (including photographs) should be submitted showing that the drainage system has been constructed as per the final agreed detailed drainage designs.

The proposed development connects to and discharges surface water flows into the Pevensey and Cuckmere Water Level Management Board (PCWLMB) area. The applicant will need to obtain consent for the PCWLMB at detailed design stage. The PCWLMB might require surface water discharge contribution, which the applicant should discuss with the board.

Yours sincerely

Edward Sheath
Head of Planning and Environment

Case Officer – Charlie Cooper, Sustainable Drainage Advisor
T: 01273 335417
E: SUDS@eastsussex.gov.uk

Head of Development and Building Control
Wealden District Council
Council Offices
Vicarage Lane
Hailsham
East Sussex
BN27 2AX

Developer Services
Southern Water
Sparrowgrove House
Sparrowgrove
Otterbourne
Hampshire
SO21 2SW

Tel: 0330 303 0119
Email: developerservices@southernwater.co.uk

Your Ref
WD/2017/0839/MAO
Our Ref
PLAN-018980
Date
24/07/2017

Dear Sirs,

Proposal: Demolition of existing buildings in B1/B8 usage and cafe and erection of 24 no. family houses.
Site: The Old Loom Mill, Ersham Road, Hailsham, BN27 2RH.
WD/2017/0839/MAO

Thank you for your letter of 04/07/2017. Please find attached a plan of the sewer records showing the approximate position of a public rising main sewer only in the vicinity of the site. This is not suitable for connection of foul (gravity) sewers.

The applicant is advised to consult the Environment Agency directly regarding the use of a package treatment plant which disposes of effluent to sub-soil irrigation. The owner of the premises will need to maintain the works to ensure its long term effectiveness.

Our initial investigations indicate that there are no public surface water sewers in the area to serve this development. Alternative means of draining surface water from this development are required.

The planning application drainage report makes reference to drainage using Sustainable Urban Drainage Systems (SUDS).

Under current legislation and guidance SUDS rely upon facilities which are not adoptable by sewerage undertakers. Therefore, the applicant will need to ensure that arrangements exist for the long term maintenance of the SUDS facilities. It is critical that the effectiveness of these systems is maintained in perpetuity. Good management will avoid flooding from the proposed surface water system, which may result in the inundation of the foul sewerage system.

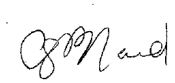
Thus, where a SUDS scheme is to be implemented, the drainage details submitted to the Local Planning Authority should:
- Specify the responsibilities of each party for the implementation of the SUDS scheme
- Specify a timetable for implementation
- Provide a management and maintenance plan for the lifetime of the development.

This should include the arrangements for adoption by any public authority or statutory undertaker and any other arrangements to secure the operation of the scheme throughout its lifetime.

Due to changes in legislation that came in to force on 1st October 2011 regarding the future ownership of sewers it is possible that a sewer now deemed to be public could be crossing the above property. Therefore, should any sewer be found during construction works, an investigation of the sewer will be required to ascertain its condition, the number of properties served, and potential means of access before any further works commence on site.

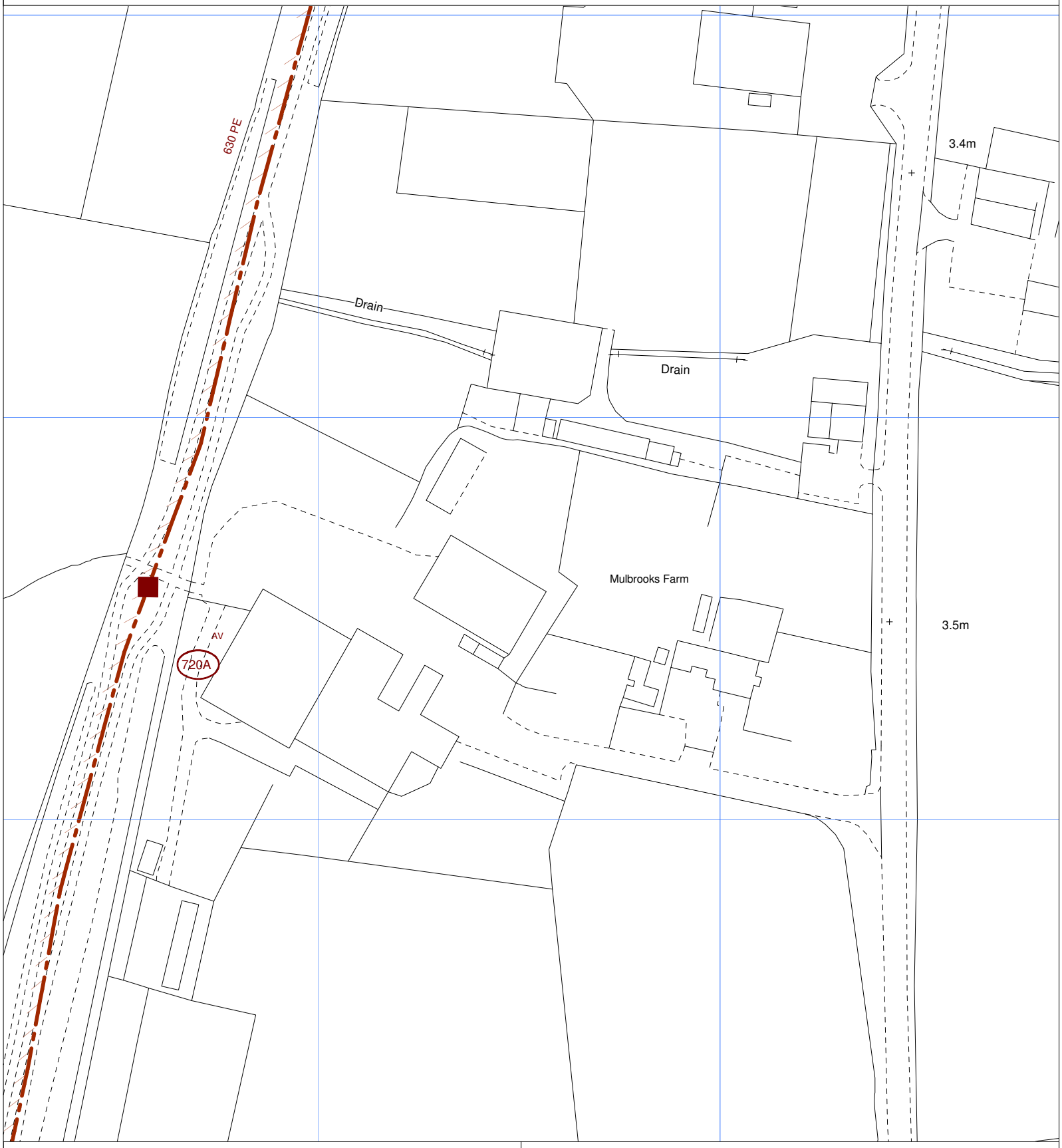
The applicant is advised to discuss the matter further with Southern Water, Sparrowgrove House, Sparrowgrove, Otterbourne, Hampshire SO21 2SW (Tel: 0330 303 0119) or www.southernwater.co.uk".

Yours sincerely



Developer Services

SOUTHERN WATER



The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site.

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Southern Water

O.S. REF: TQ5807SE	Scale: 1:1250	Printed By: ganesas	Date: 5-7-2017
Screen Print		Southern Water MapGuide Browser	
WARNING: BAC pipes are constructed of Bonded Asbestos Cement		Requested By:	
WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement			

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

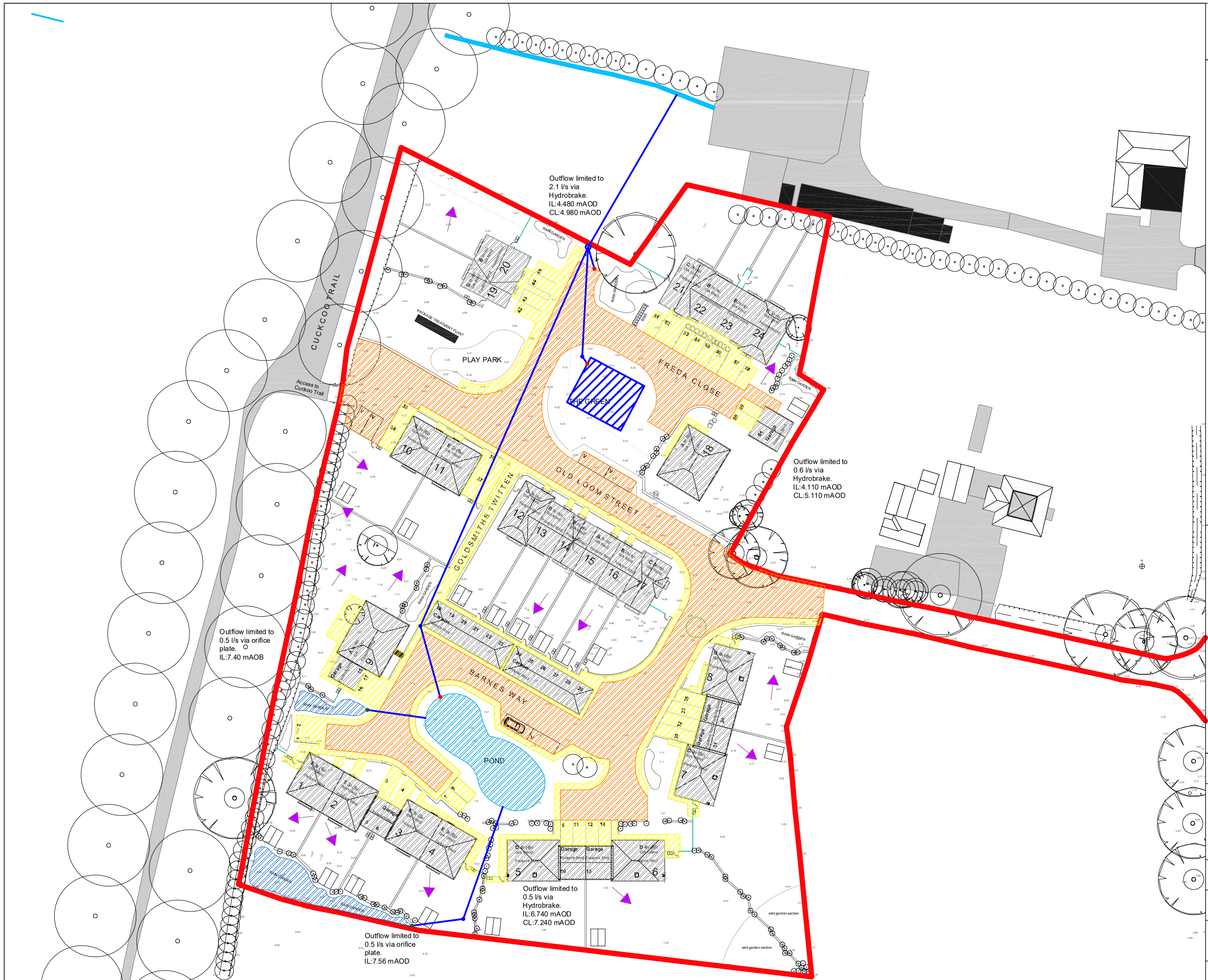
Hydro-Brake® Optimum Outflow Control

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		



Key

- Proposed Surface Water Pipework
- Proposed Inspection Chamber
- Proposed Pond (Attenuation Basin)
- Proposed Orifice Plate
- Design Exceedance Route
- Proposed Hydrobrake
- Proposed permeable paving
- Paving
- Proposed Attenuation Tank
- Proposed Rain Garden
- Roof Area

Notes:

1. All levels are in metres above ordnance datum

Client:
Aitco Ltd

Site Address:
Old Loom Mill
Earsham Road
Halisham
BN27 2RH

Job Reference:	Date:
89594-Ecotecture-OldLoomMill	21-Aug-20
Drawing Number:	**Revision:**
89594-01	V.1

Designed by:	Drawn by:	Checked by:
TS	TS	EB

Scale:
1:500@A2

Disclaimer:
The drawings provided are for planning purposes only.

Unda Consulting Ltd
Southpoint
Old Brighton Road
Gatwick
RH11 0PR

Southern Testing
Environmental & Geotechnical

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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

TABLE OF CONTENTS

TABLE OF APPENDICES

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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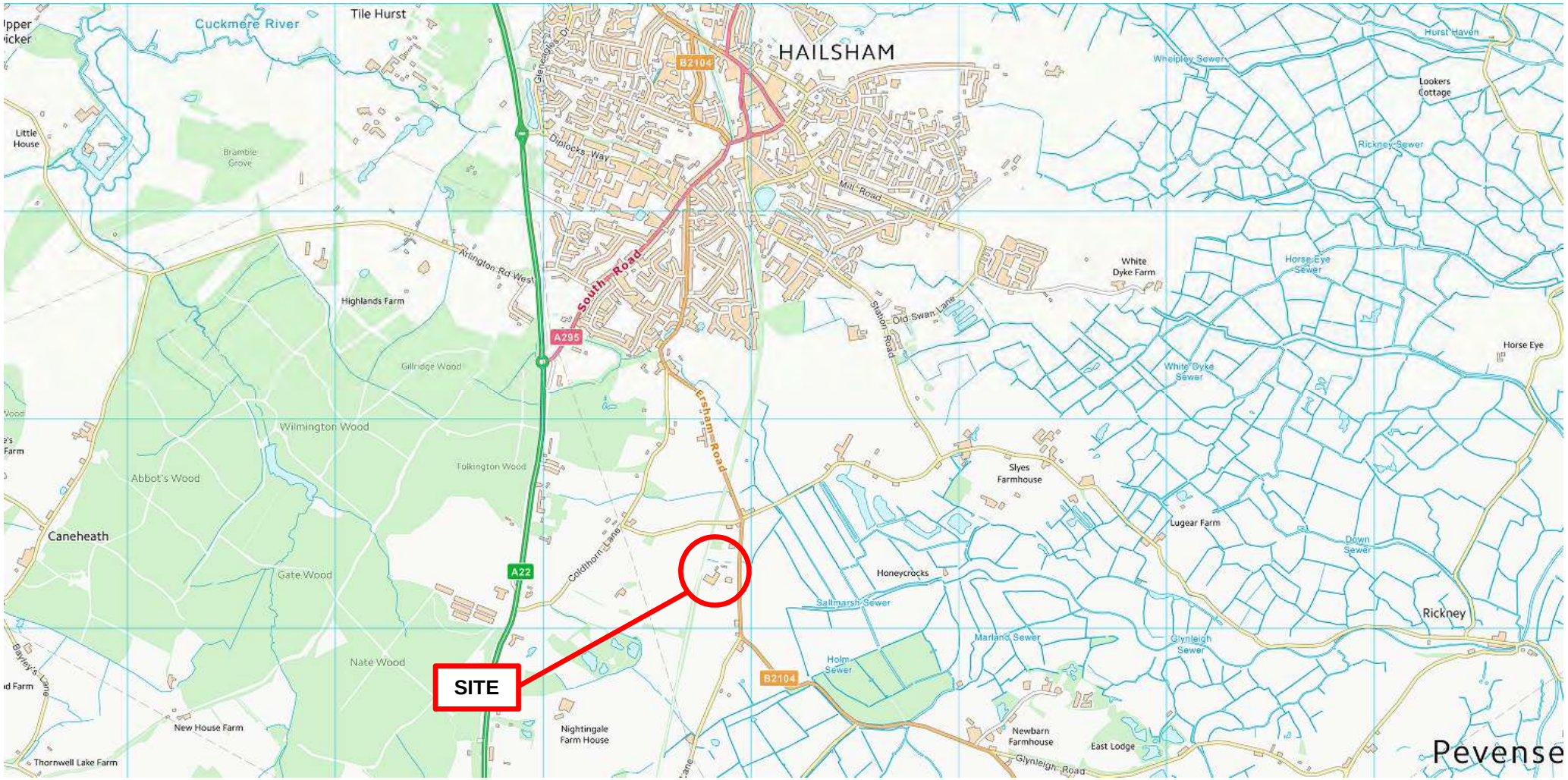
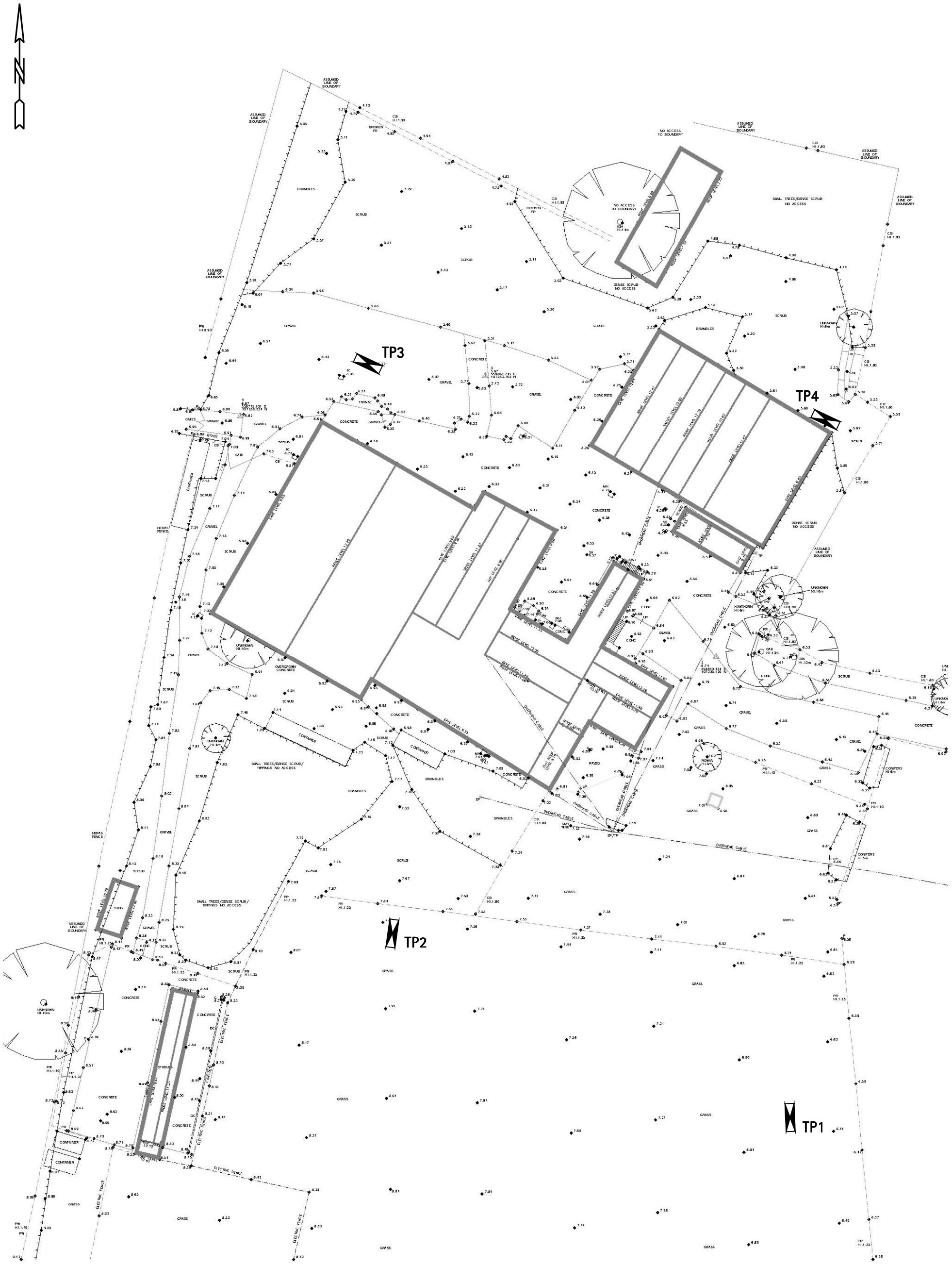


Site:	Old Loom Mill, Hailsham	Project Id:	J14496
Figure 1	Site Location Plan	Date:	July 2020



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

ST Consult

Southern Testing
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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
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:
				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
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:
				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)

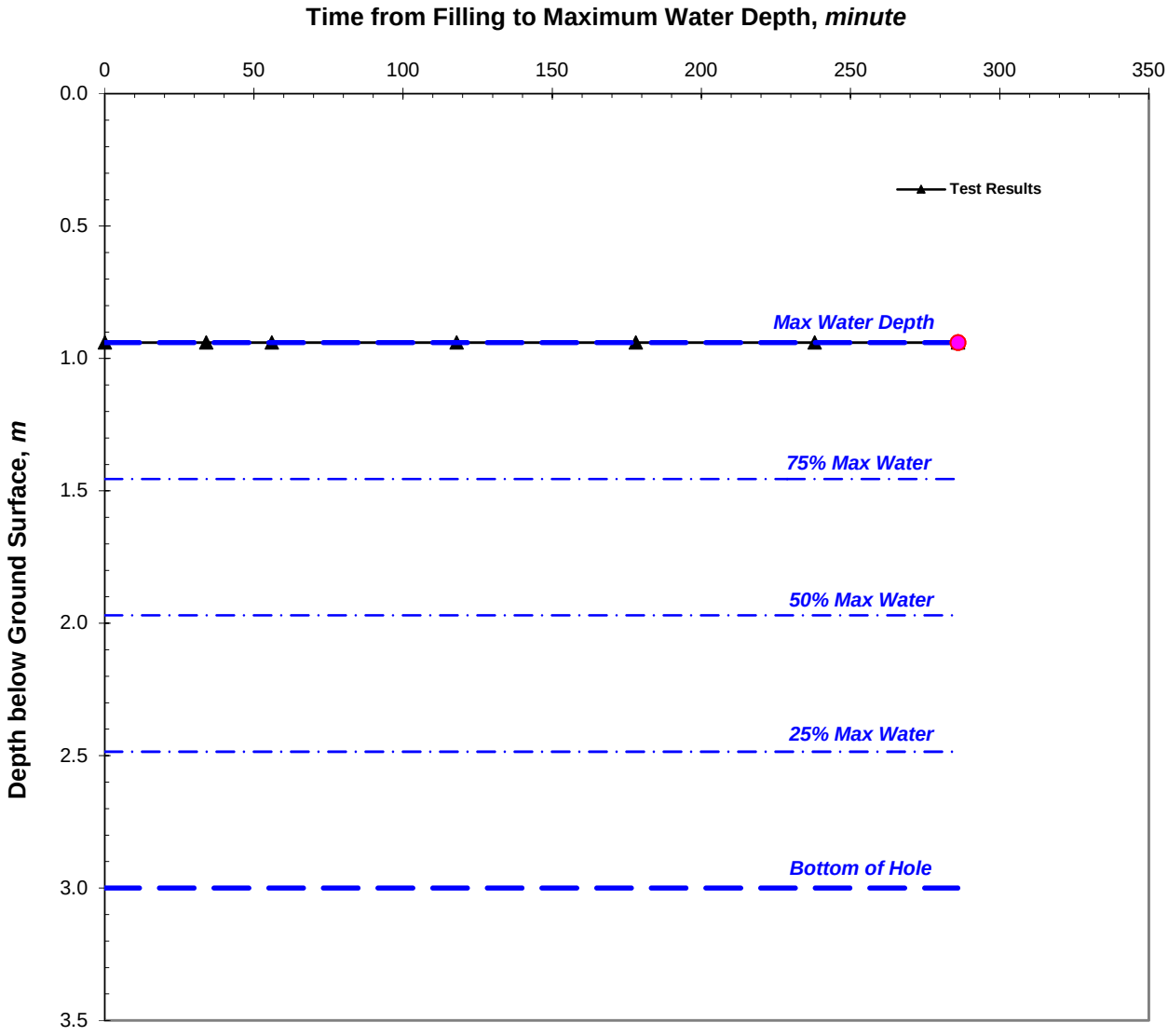
The BRE DG365 Ref [3] paper on soakaway design allows for the design of trench soakaways as well as traditional square and circular soakaways.

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**

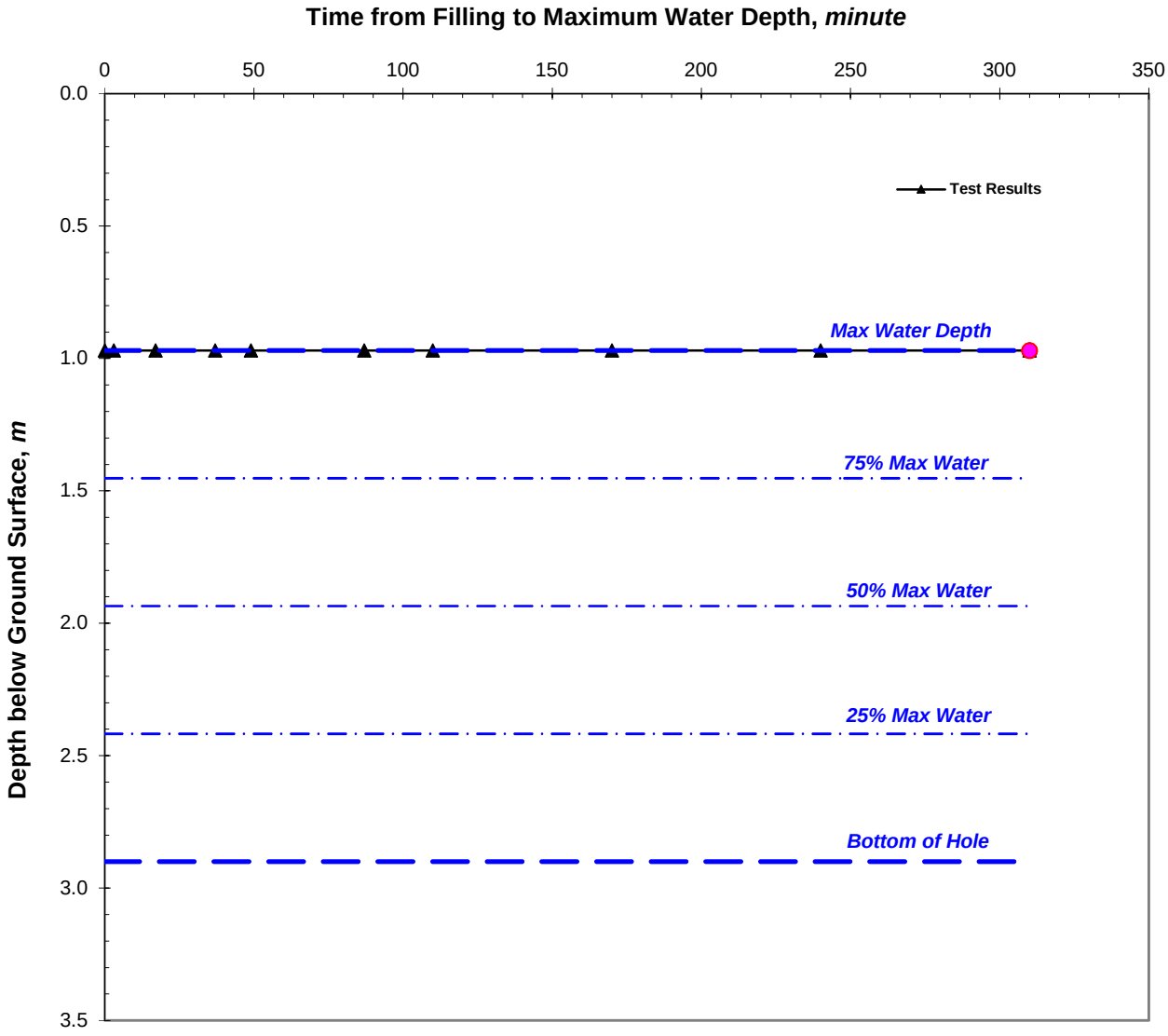
Comments:

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**

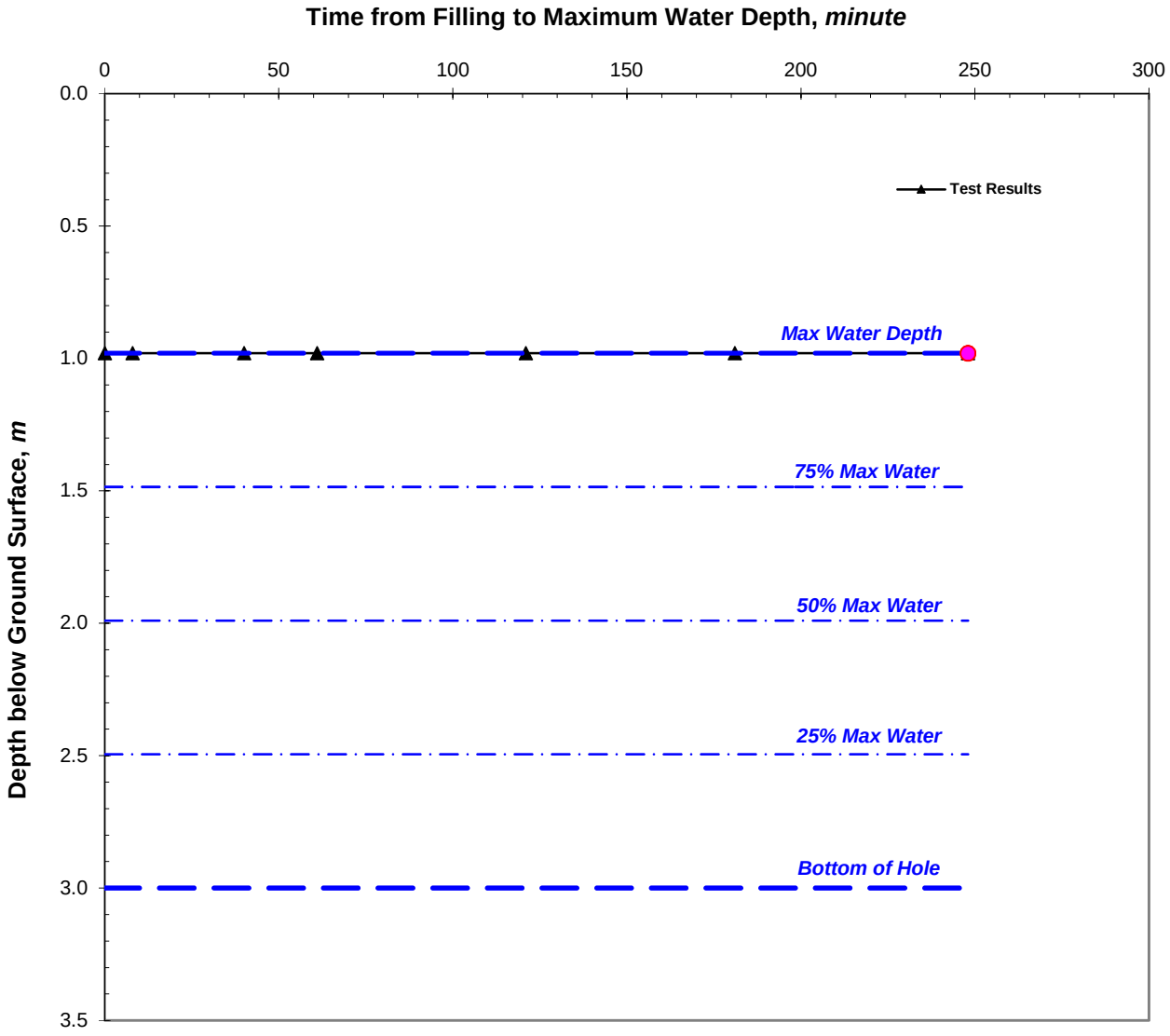
Comments:

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**

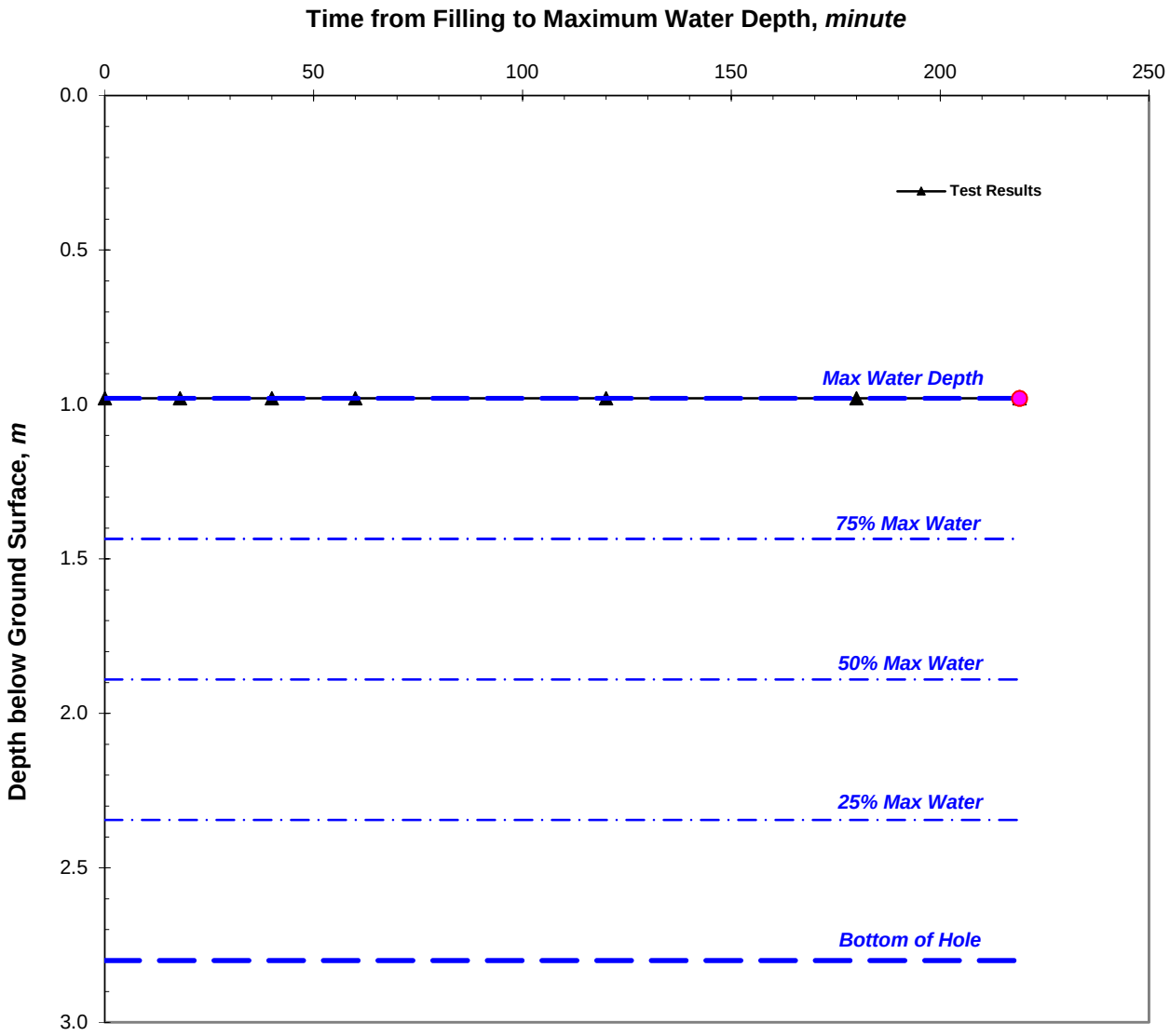
Comments:

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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