clive onions
consulting civil engineer

The Island Project

Jerrings Hall Farm, Tanworth Lane, Solihull, B90 4DX

Flood Risk Assessment and Drainage Strategy

Clive Onions Ltd is complying with Government guidance and continuing to work and support UK business during the Covid-19 crisis, to help enable a speedy return to normal business, when safe to do so. We are working from home using our office systems and keep in touch by video conferencing, etc. We will not visit site, but liaise with companies who can provide appropriate site information if required.

23rd April 2020 V3

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Contents

Appendices

Report prepared by Sam Rice – BSc (Hons)
Report approved by Clive Onions - BSc, CEng, FICE, FCIWEM, MIStructE, MCIHT
Detail Drainage design by Stability Consulting Ltd

Version history

Version	Date	Prepared by	Approved by	Comment
V1	18.09.18	SR	CO	Issued for approval
V2	21.04.20	CO	CO	Strategy developed to final scheme
V3	23.04.20	LJ	CO	Comments incorporated

Issue history

Version	Date	Issued to	Method
V1	18.09.18	Sanderson Weatherall LLP	Email pdf
V2	21.04.20	Sanderson Weatherall LLP & Stability Consulting Ltd	Ditto
V3	23.04.20	Sanderson Weatherall LLP & Stability Consulting Ltd	Ditto

1. Introduction

The Island Project comprises the redevelopment of the Jerrings Hall Farm site for the relocation of a special needs school including conversion works, internal and external alterations to the listed buildings, the installation of two single storey modular buildings, construction of car park, taxi drop-off and waiting area, infrastructure works and associated landscaping.

The site is located in Flood Zone 1, at low risk of fluvial flooding, and according to the Environment Agency surface water flooding maps there is low risk of surface water ponding.

This Flood Risk Assessment and Drainage Strategy (FRADS) considers flood risk to the site and off-site and describes the surface and foul water drainage strategy using sustainable drainage techniques following site-specific investigations.

2. Site Location and Setting

The site is located to the east of Dickens Heath, at Jerrings Hall Farm, Tanworth Lane, Solihull, B90 4DX.

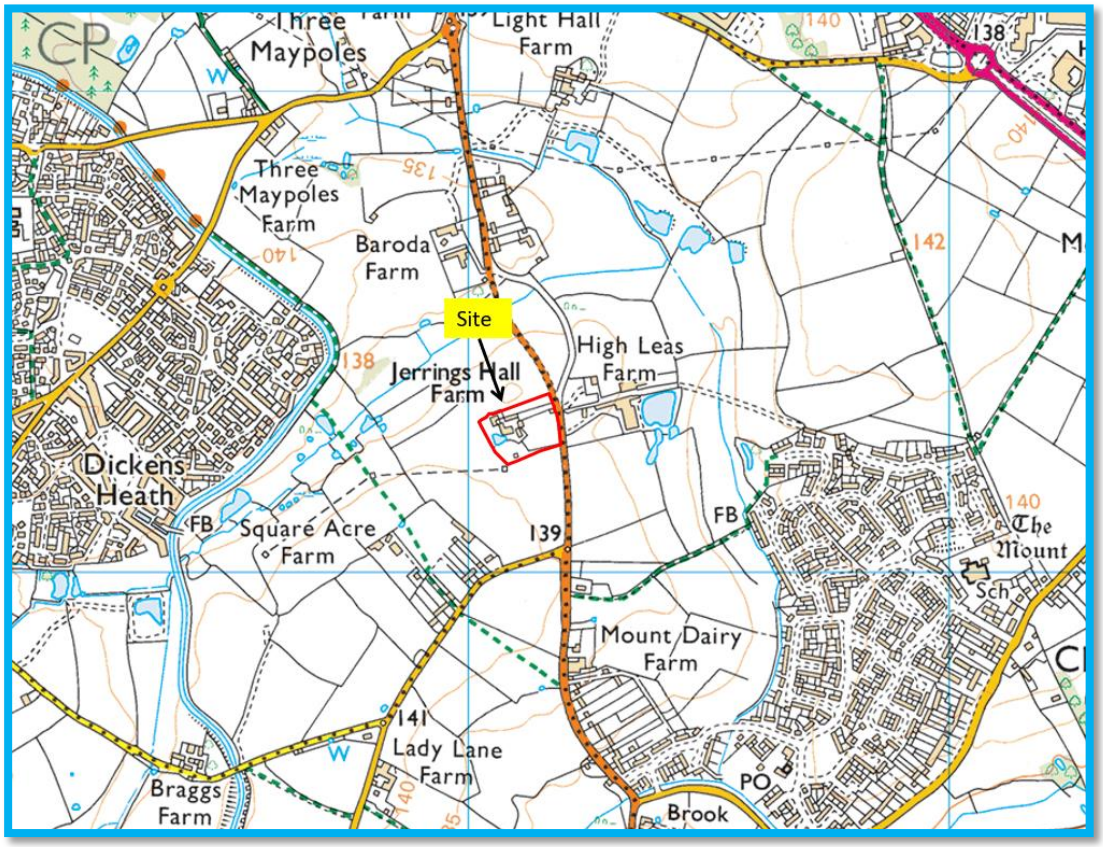


Fig 1 Site related to the local area (Streetmap).

The site is in the following setting:

- North of the site is a local brow of a hill within a field laid to pasture, which mainly falls northwards, away from the site, and towards a minor watercourse.
- To the east is Tanworth Lane (B4102) beyond which is High Leas Farm, on land falling away from the site to the east, which contains some ponds and a minor watercourse.

- To the south is a large field used for hay and grazing, with Lady Lane beyond, on land falling to the east.
- To the west the land forms a ridge, and rises very gently and then falls, with the ridge falling to the north, and the land is used for hay and grazing.

Fig 2 Satellite view with site in red line (Google Earth image by Infoterra and Bluesky).

The site can therefore be described as being surrounded by farmland, on a ridge with land generally falling away from the site in all directions.

3. Existing Development and Ground Conditions

The site is roughly rectangular in shape, approximately 105m north to south and 155m east to west.

The site development comprises multiple buildings, including barns and a main farmhouse. The buildings surround a central courtyard with open land surrounding the cluster.

An ornamental pond with some perimeter small trees and shrubs lies to the southwest of the building group, which has a summerhouse and steps to the pond edge.

The topographic survey shows levels are between 139.39m AOD in the northwest and 136.25m AOD in the southeast, giving an average fall of 1 in 55 across the site. The access from Tanworth Lane is at 137.64m AOD. The water level of the pond on the day of the survey was 138.51m AOD, with the pond top water level about 400mm below the courtyard level.

Drainage surveys have also been undertaken and show 3 separate septic tanks/treatment works on the site. Surface water drains to traditional soakaways which appear to be blocked/silted up. A drain is located in the southeast of the site on the line of an historic ditch.

The British Geological Survey viewer shows the underlying geology to be diamicton with clay and silt in the north with mudstone bedrock. According to the Cranfield University Soilscapes viewer, the soil tends to be loamy and clayey with impeded drainage and seasonally wet. The ability to maintain ponds on the site indicates that the ground is not well suited to soakaways.

Fig 3 Satellite view of the site (Google Earth image by Infoterra and Bluesky). Shows buildings, courtyard and pond to the southwest with trees around.

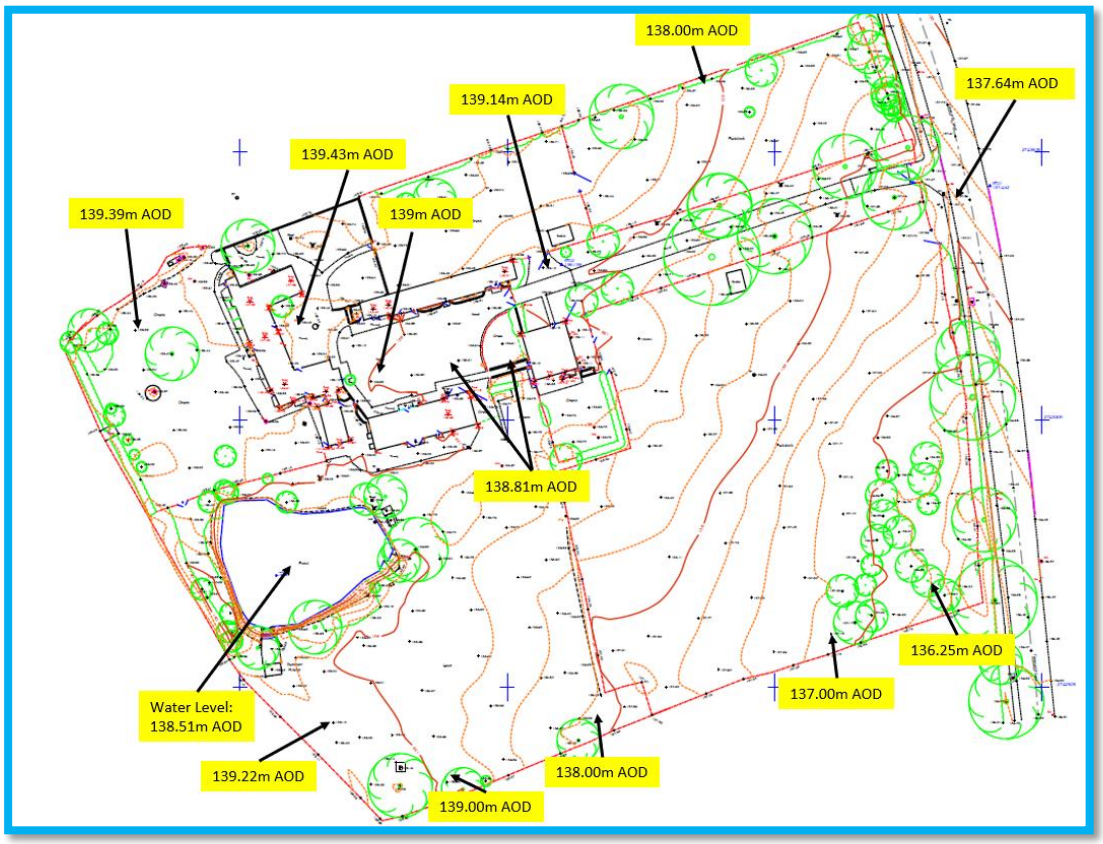


Fig 4 Contoured topographic survey annotated with the key levels.

4. Proposed Development

The proposed development comprises redevelopment of the site for the relocation of a special needs school including conversion works, internal and external alterations to the listed buildings, the installation of two single storey modular buildings, construction of car park, taxi drop-off and waiting area, infrastructure works and associated landscaping.

The proposed car park will be formed in 'Grasscrete' or similar grass-infill permeable system and the infrastructure includes a new sewage treatment works with drainage mound.

It is proposed to use existing pipework where feasible, and provide new separate foul and surface water drainage systems designed to modern sustainable standards

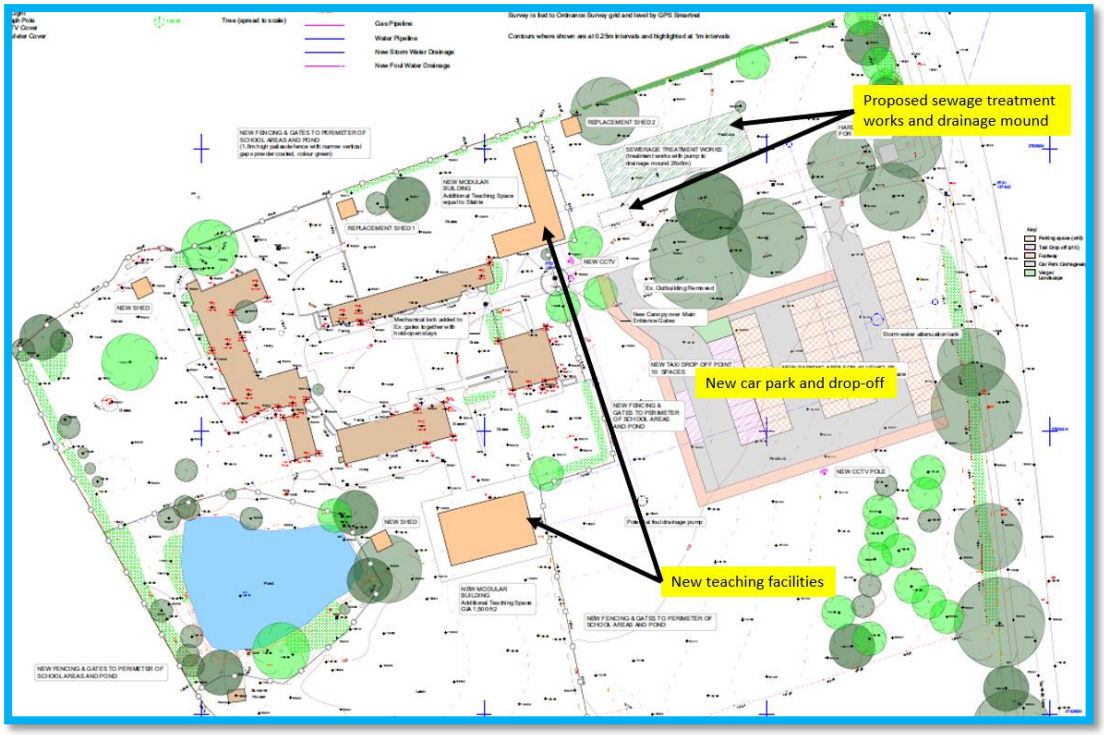


Fig 5 Proposed development showing location of proposed units, carpark and treatment works.

5. Flood Risk and Hydrology

According to the Environment Agency (EA) Flood Map for Planning the site is located in Flood Zone 1, at low risk of flooding, so the proposed development is appropriate.

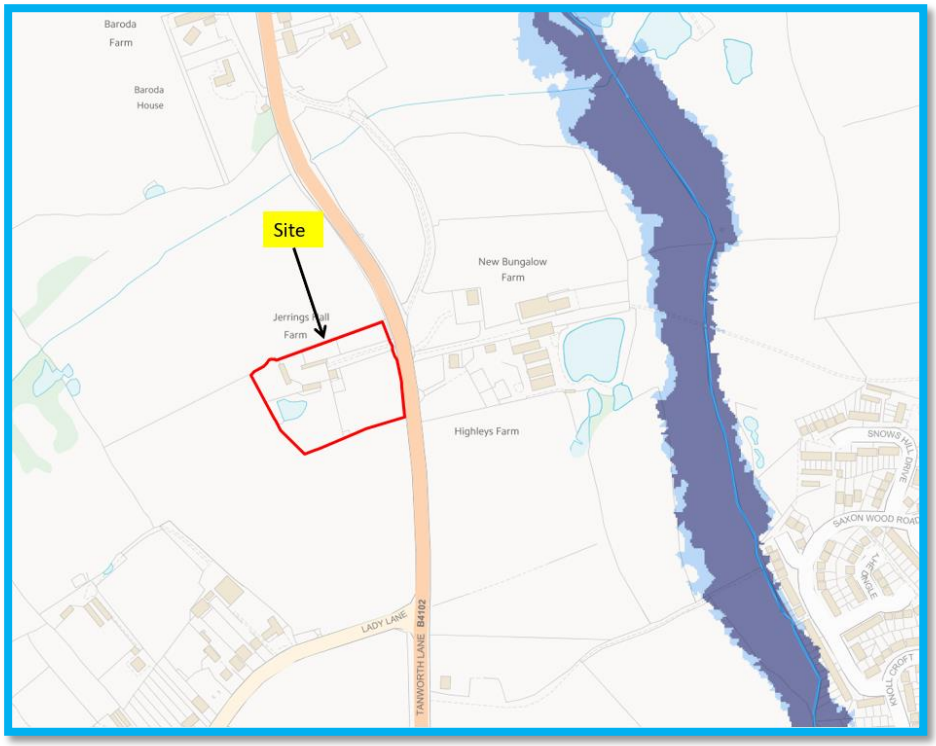


Fig 6 EA Flood Risk Map for Planning showing the site in Flood Zone 1, at low risk of flooding.

The EA Surface Water Flooding Map shows the majority of the site to be at very low risk from flooding, with some localised fragmented ponding along the southern and eastern boundaries shown, but this will not affect the proposals.

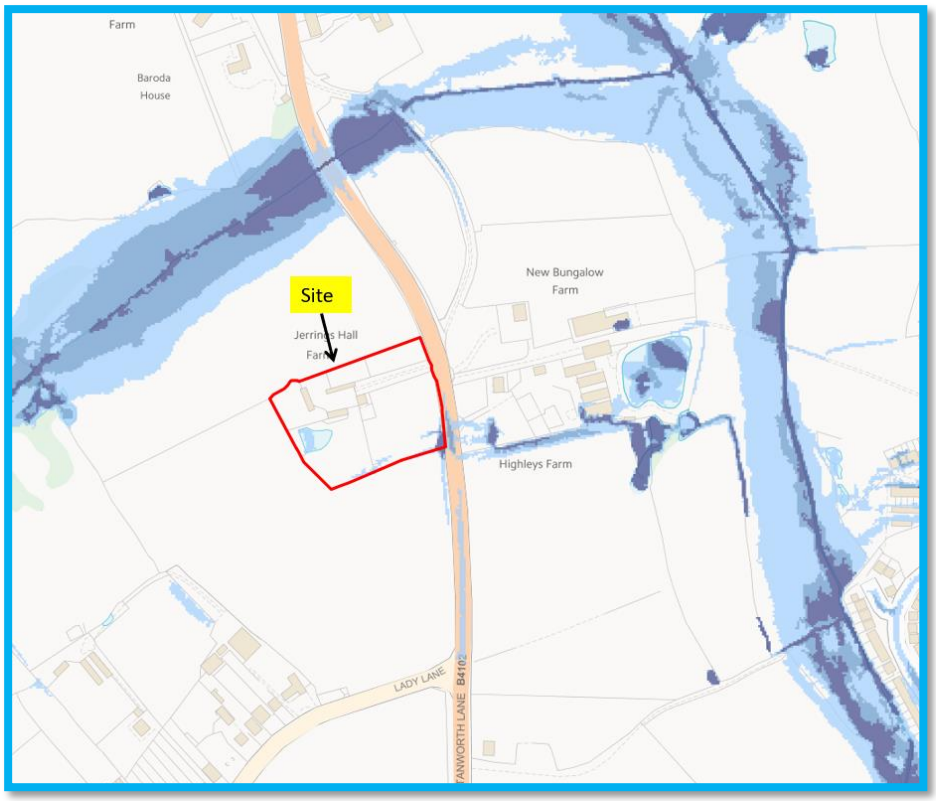


Fig 7 EA Surface Water Flood Risk Map showing site at low risk of flooding, consistent with its location. Note evidence of ditch along southern boundary, draining to the east.

The historic maps and the topographic survey have been investigated and confirm a drainage corridor along the south of the site.

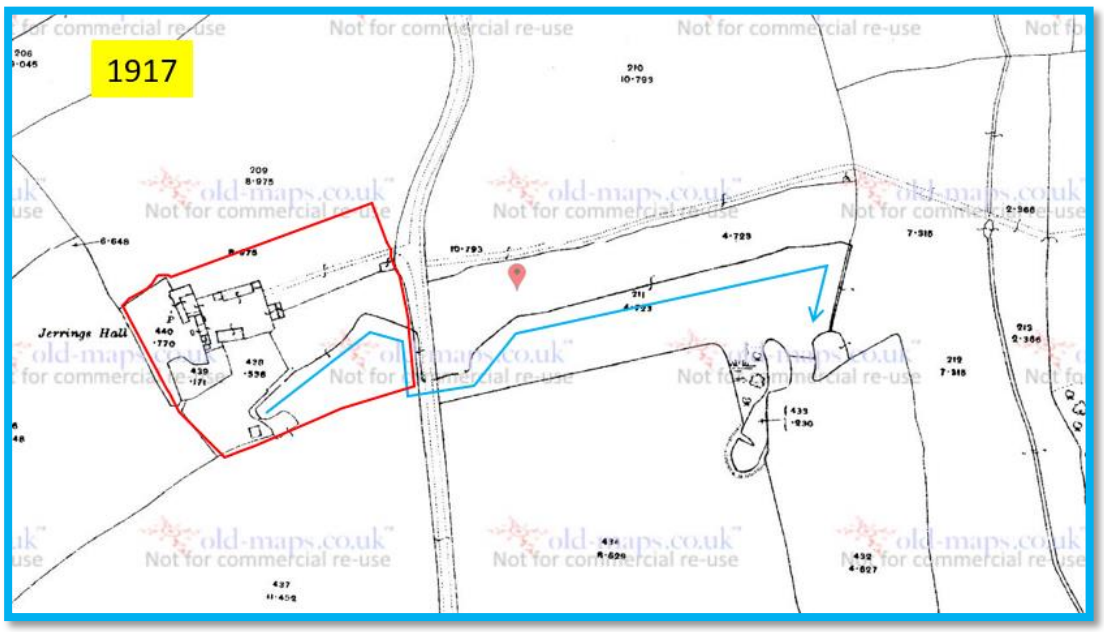


Fig 8 Historic map from 1917 showing former surface water ditch within site (highlighted by parallel blue line) (old-maps.co.uk).

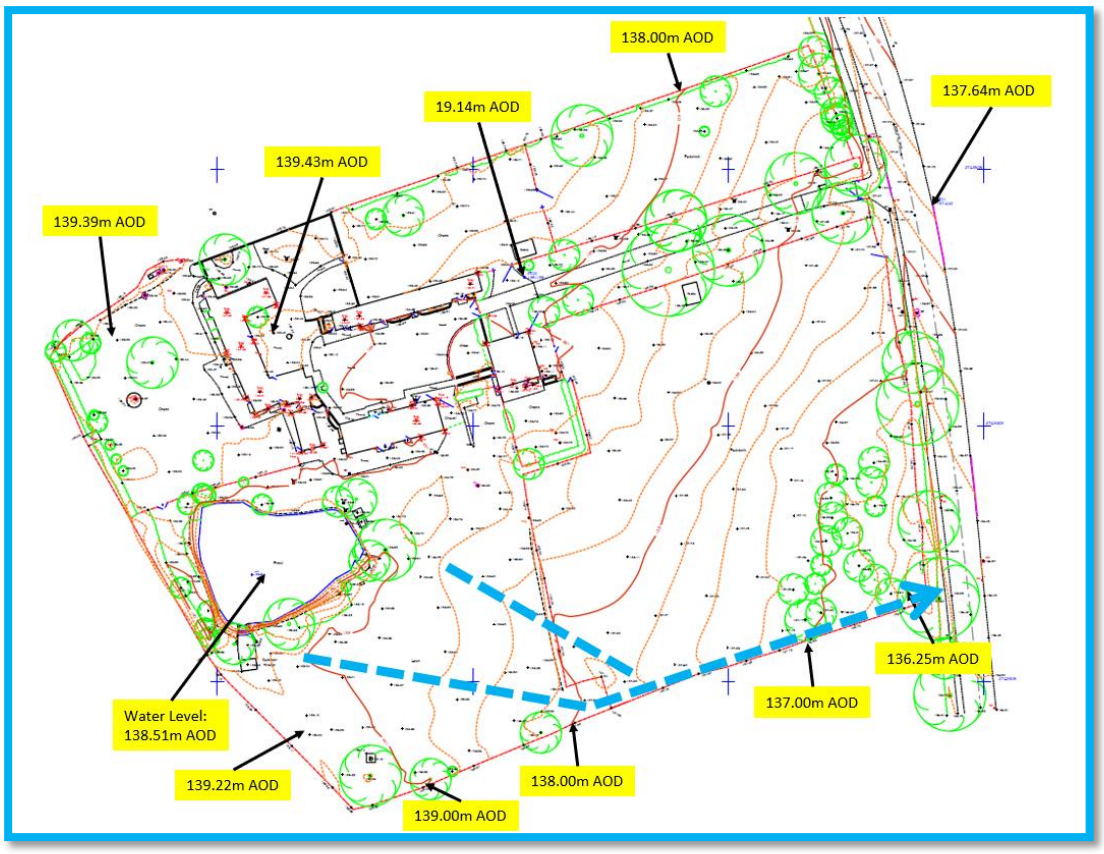


Fig 9 Annotated topographic survey showing current lie of land and watershed.

The Medium Risk Scenario shows that access to the site will not be adversely affected by flood risk.

Fig 10 EA Surface Water Flood Risk Map for a medium scenario (1 in 100 year).

6. Surface Water Drainage

Rainwater runoff from the existing roofs and paved areas is gathered by downpipes and gulleys, but they tend to lead into blocked presumed rubble filled soakaways, land drains, etc within the site, according to the CCTV survey which has been undertaken. Some of the rainwater pipes discharge onto the paving, and some of the pipes were collapsed and inaccessible to survey access.

A basement area in the northwest for the site is flooded, and nearby is an historic soakaway, considered to be too close to the buildings and the potential cause of the infiltration.

The roof water from the building to the northwest drains into the sewage treatment works system, which is not acceptable.

The pond receives flows from a pipe which does not lead to the buildings; there is no evident surface water discharge to the pond, nor is there a defined outlet.

The conclusion is that there is no formal 'system', and the system should be rationalised sustainably for the long-term operation of the site to enable structured planned maintenance.

Soakaway Tests were carried out by Integrale Ltd on 13th and 16th December January 2019, during a recognised prolonged wet period, to determine the porosity between 1.1m depth and 1.6m depth at a range of locations. The test locations are shown in Appendix 2, and the results in Appendix 4. None of the tests could drain water and could not therefore comply with BRE 365.

The CCTV drainage investigation has revealed a 150mm surface water drain within the site, which is in the location of the former ditch, at the low point of the site, as shown in the figure above. It is therefore proposed to use this existing drainage connection which drains the natural runoff from the site, to provide a positive, albeit attenuated, discharge point.

Fig 11 Annotated drainage survey showing unstructured arrangement.

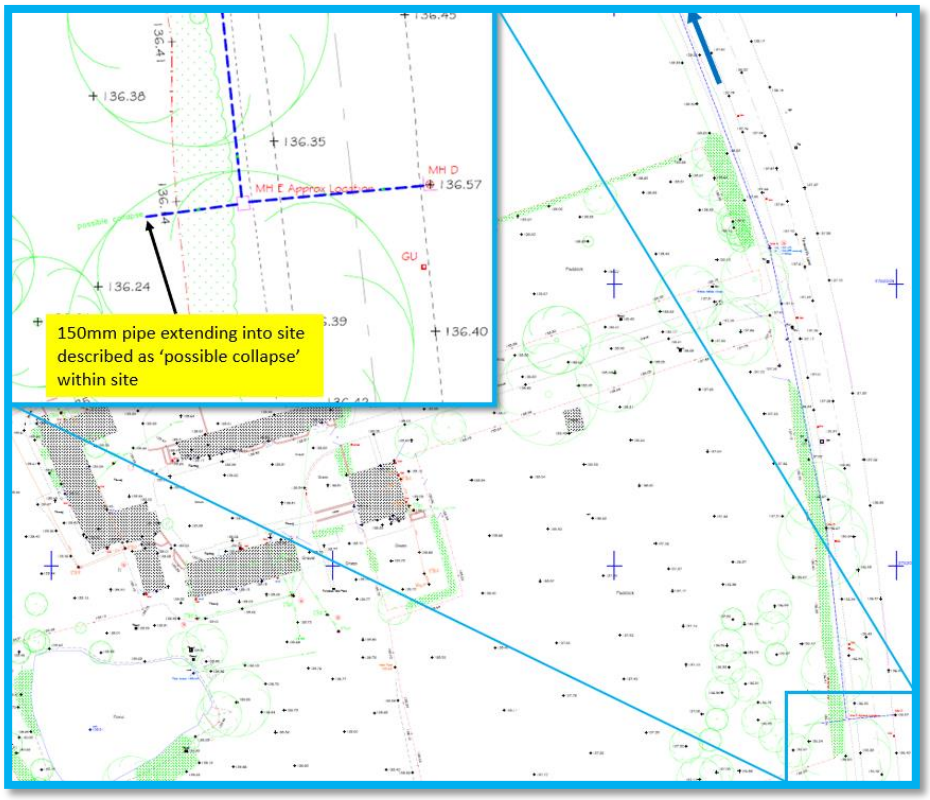


Fig 12 CCTV survey record showing 150mm drain extending into site, connected into culverted ditch which drains to the north to the watercourse (see Fig 9) (Solum Surveying).

Fig 13 CCTV image of 150mm pipe draining southeastern corner of site (Solum Surveying).

As part of a sustainable approach, the existing surface water drainage system will be investigated as work proceeds, the condition surveyed, and appropriate repairs made. Gulleys and catchpits/manholes will be inspected and cleared of debris, and gratings restored where appropriate, and especially made safe given the attendants at the school. Outlets will incorporate traps to intercept debris and allow maintenance and inspection.

The system will be separated from the foul drainage system in line with modern standards.

Pipes which can be reused will be reused, and an efficient system installed where necessary, laid to falls and operated by gravity where feasible.

The network will be recorded to inform a future maintenance programme.

A single surface water drainage network will be formed conveying the drainage by gravity to the southeastern part of the site, where the runoff will be attenuated in a vegetated pond, with safe side slopes. The pond will be designed to accommodate the 1 in 100 year runoff with 40% additional rainfall as a result of predicted climate change. The pond will drain through an outlet controlled by vortex flow control device, as described in the detail design by Stability Consulting Ltd to the greenfield runoff rate or 2 l/s, whichever is appropriate. The pond will be ‘dry’ in normal circumstances.

The discharge will be to the existing 150mm drain which already serves the site and discharges into a culverted ditch which drains to the north and into the existing watercourse, as established by CCTV survey.

The pond will improve runoff quality, intercept silt and provide a biodiverse habitat. The planting is specified in the Ecological Survey (Ecological Enhancements section) submitted in support of the planning application.

The car park will be formed in 'Grasscrete' or similar reinforced permeable grass system, suitable for cars and light vans. This will allow the surface water to infiltrate into the ground and be managed by evapotranspiration, mimicking the natural characteristics of the area. The system will be installed in accordance with the manufacturer's instructions.

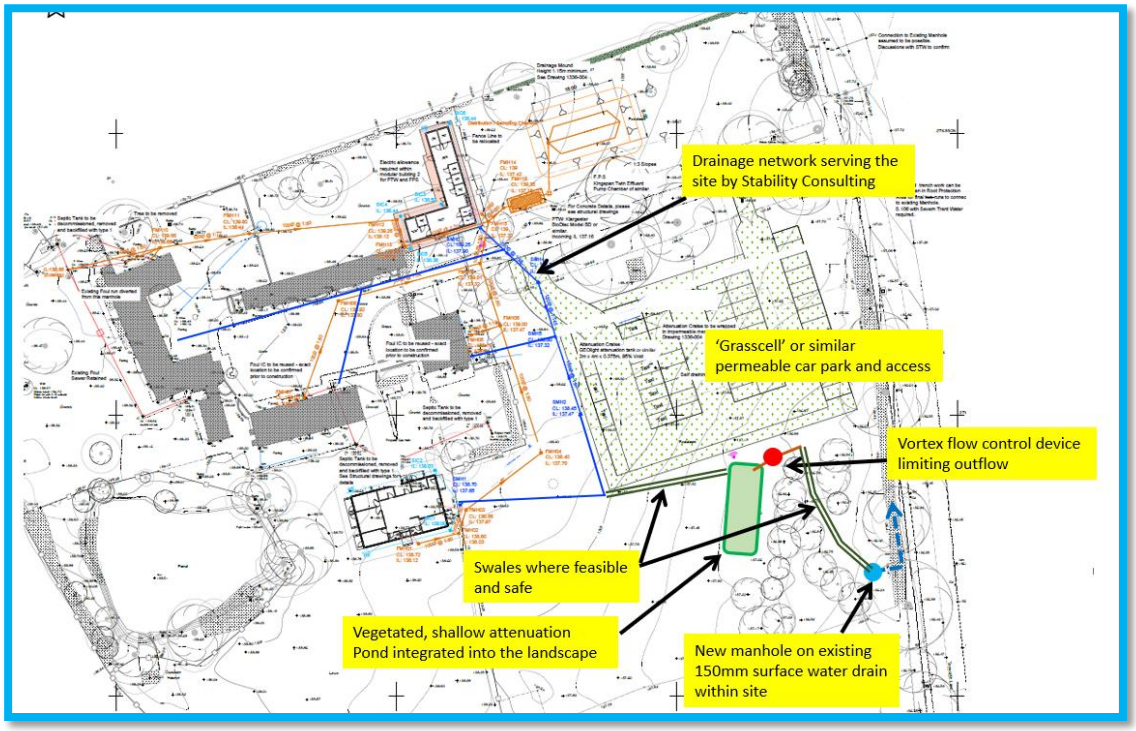


Fig 14 Surface and foul water drainage design (by Stability Consulting Ltd).

Exceedance flows will follow existing natural routes to the low point in the southeast of the site as shown in the contoured plans above, and then discharge onto the road and then eastwards across the fields, mimicking the natural terrain and flowing through farmland.

Fig 15 Exceedance flood routes replicating natural characteristics.

7. Foul Water Drainage

Effluent from the foul appliances in the western part of the existing development is conveyed to an on-site treatment works, treated and discharged off-site and understood to be infiltrated in 3rd party land.

There are no reports of nuisance from the operation.

Effluent from the foul appliances in the eastern part of the existing development is conveyed to two separate on-site septic tanks, but the soakaways could not be accessed.

The design standards for the existing treatment processes are unknown, and there is no record of consent to use 3rd party land for discharge of effluent.

Severn Trent Water has been contacted and confirmed that the nearest adopted foul sewer is 442m to the east at grid reference X412499:Y276337, with another 518m along the road to the south, at grid reference X412037:Y275988, as shown below. These are unreasonable distant from the site. Applying the Binding Rules criterion, (30m/house distance to nearest foul sewer) the limit for the equivalent flow from the site would be 208m. The available sewers are well beyond this distance. It has therefore been decided to treat effluent on site.

Fig 16 Location of nearest adopted foul sewers in relation to site.

The proposed peak attendance at the school will be 23 pupils and 50 staff. There will be no canteen – pack lunches will be used by all attendees at the school.

The market leader for sewage treatment plants, Klargester, has been consulted and has recommended their BF Biodisc unit as illustrated in Appendix 1. They have also supplied installation details and pump station details to raise the effluent.

Soakaway tests were undertaken by Integrale and found the most suitable ground was in the north of the site, where the land is highest but suitably away from the buildings to comply with the siting requirements of the Building Regulations.

As the underlying percolation rates are shown to be poor, shallow tests were undertaken in accordance with Building Regulations H2 Paragraph 1.35 and 1.36, which revealed a Vp of 40.96 (See Appendix 3).

In accordance with Paragraph 1.44 the area of the Drainage Mound is assessed; a school without canteen is said to generate 50 l/hd/day according to British Water Loads (compared to a daily person use of 150 l/hd/day). So, the 23 + 50 attendants would represent a population equivalent of 73/3 = 24.3 people.

Based on this the area of the Drainage Mound required would be:

$$A_t = p \times Vp \times 0.25 = 24.3 \times 40.96 \times 0.25 = 250\ m^2.$$

In accordance with the Building Regulations, given the potentially high groundwater level (as discovered by the deep soakaway tests) a Drainage Mound is proposed (See Diagram 2 from Building Regulations and associated notes below).

It is recommended that a Drainage Mound of 250m^2 area is formed, with vegetated sides and top, in accordance with approved detail below.

The School sees the mound as a virtue and a visual amenity to contribute to the landscape.

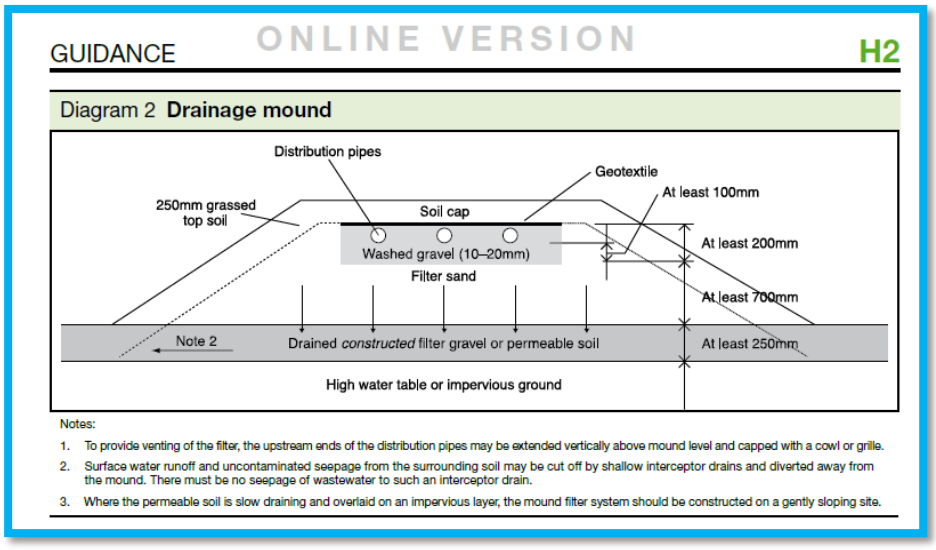


Fig 17 Extract from Building Regulations showing Drainage Mound suitable for ground with high groundwater. The distribution pipes will be in accordance with Diagram 1 of Building Regulations.

The effluent flow from the Klargester sewage treatment works will therefore be pumped at a low rate onto the drainage field and managed by the construction of the Drainage Mound.

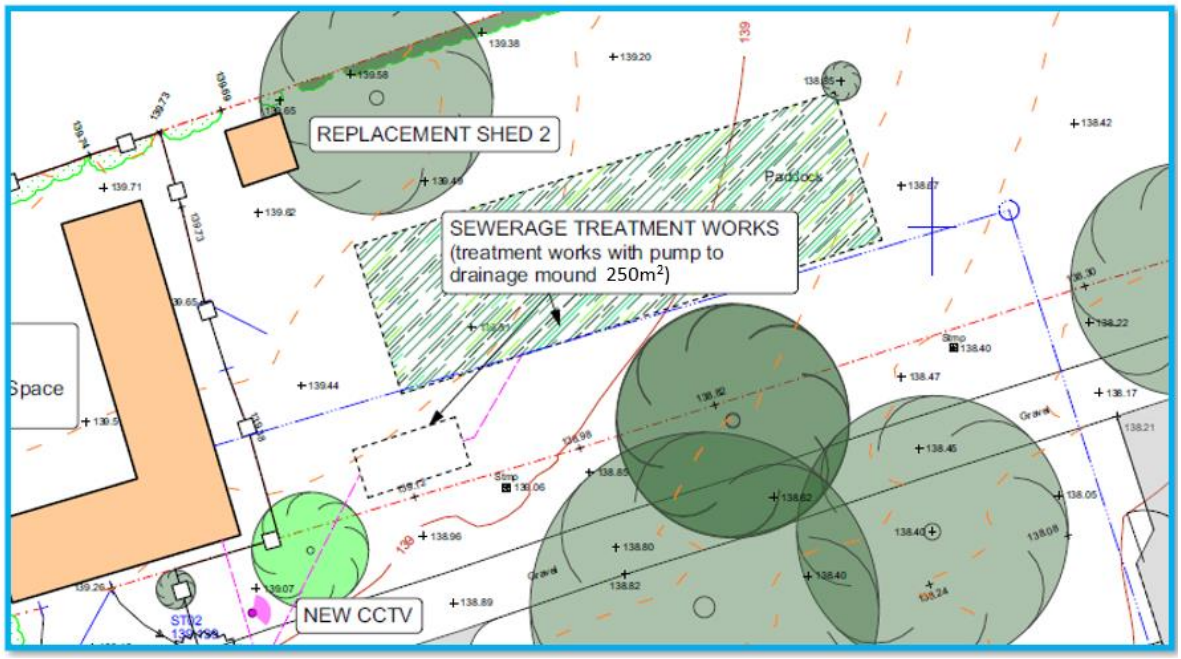


Fig 18 Location of sewage treatment works more than 10m from the adjacent buildings, and the drainage mound more than 15m from the adjacent buildings, to comply with Building Regulations.

8. Management and Maintenance

The Island Project will be responsible for the management and maintenance of the site development including the drainage infrastructure.

The drainage system will be recorded and a maintenance schedule prepared to inform the maintenance company.

The site will be inspected frequently for safety reasons, bearing in mind its operation with vulnerable children, and this will include inspection of the drainage system.

The site will therefore be maintained to ensure the safe operation for the lifetime of the development.

Maintenance of the sewage treatment plant will in accordance with the manufacturer's instructions and a routine service contract will be secured.

9. Conclusions & Recommendations

The Island Project is proposing to redevelop Jerrings Hall Farm to form a special needs school. The development includes conversion works, internal and external alterations to the listed buildings, the installation of two single storey modular buildings, construction of car park, taxi drop-off and waiting area, infrastructure works and associated landscaping.

The site is in Flood Zone 1 at low risk of fluvial flooding. The Environment Agency Surface Water Flooding Map shows the site to be at low risk of surface water flooding, consistent with the topography.

The proposal will improve the drainage system and form a separate system, with foul water draining to a modern treatment works, designed for the population, discharging to a drainage mound in accordance with the Building Regulations.

Surface water runoff will be gathered and directed to a vegetated attenuation pond to improve runoff quality and enhance biodiversity. The outlet from the pond will be controlled and discharged to the existing drain in the southeast low point of the site.

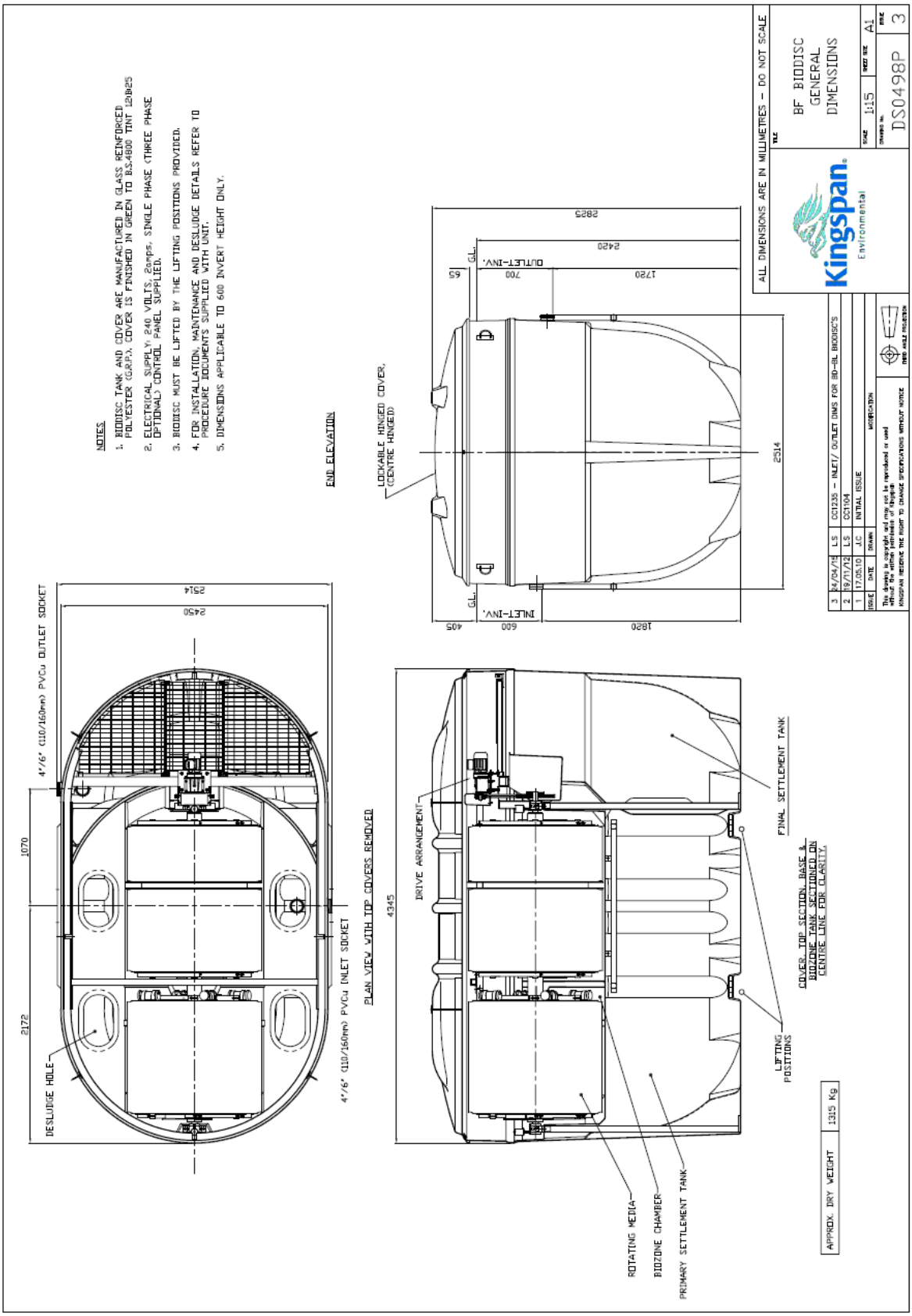
The Gasscrete (or similar) parking area will drain by natural infiltration and evapotranspiration.

The proposed drainage strategy is site-specific and an appropriate sustainable drainage system for this site, encouraging biodiversity and other SuDS virtues. It will provide a modern system much improving the existing system.

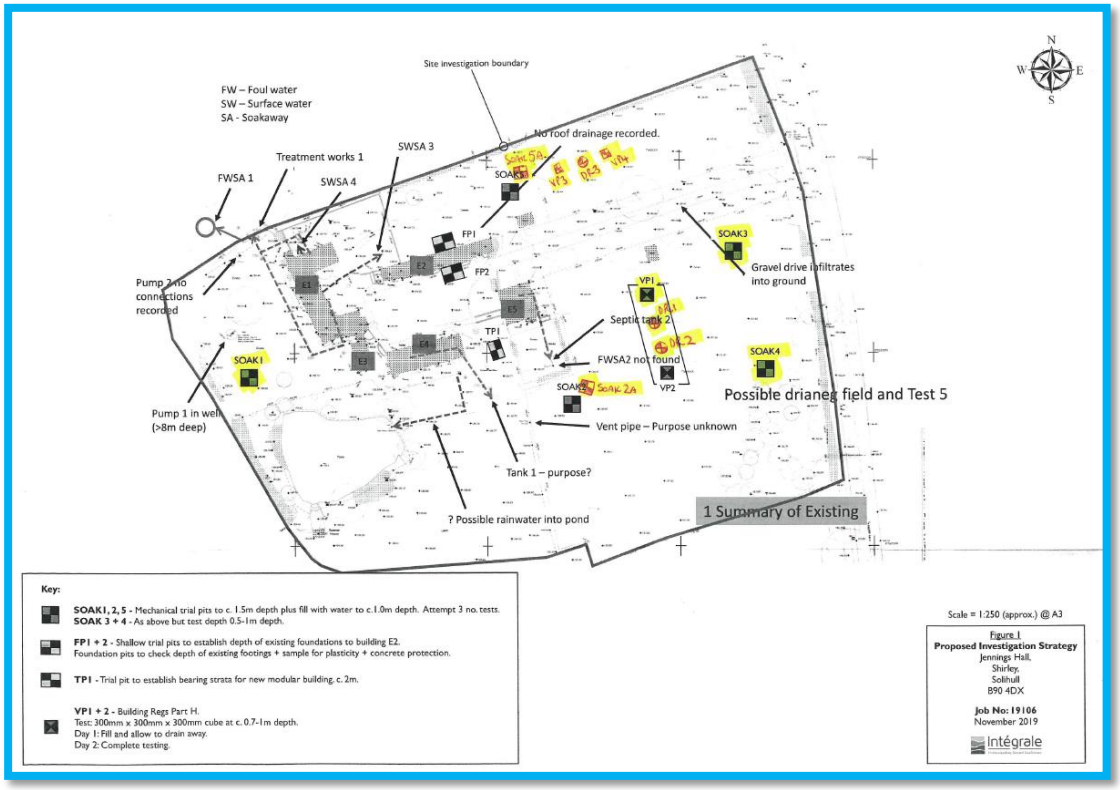
The site is will be frequently inspected and well maintained to ensure its reliable and safe operation for the lifetime of the development.

The proposal therefore satisfies the guidance in the NPPF and sustainable drainage policies and represents appropriate sustainable development for this proposal.

Appendix 1 Klargester BF Biodisc detail drawing



Appendix 2 Geotechnical Investigation Results – Soakaway test locations



Appendix 3 Soakaway Test result at VP3 (foul drainage soakaway test)

Intégrale
Understanding Ground Conditions

Suite 7, Westway Farm Business Park
Wick Road
Bishop Sutton
BS39 5XP
Tel: 01275 333 036
www.integrale.uk.com

Job No:	19106	**Soil Infiltration Rate Test**			
		Building Regulations Part H (2010)			
Job Name:	Jerrings Hall Farm			Hole:	**VP3**
Prepared By:	JB	Date:	13/01/2020	Sheet:	1 of 1
Checked By:	AH	Date:	13/10/2020		

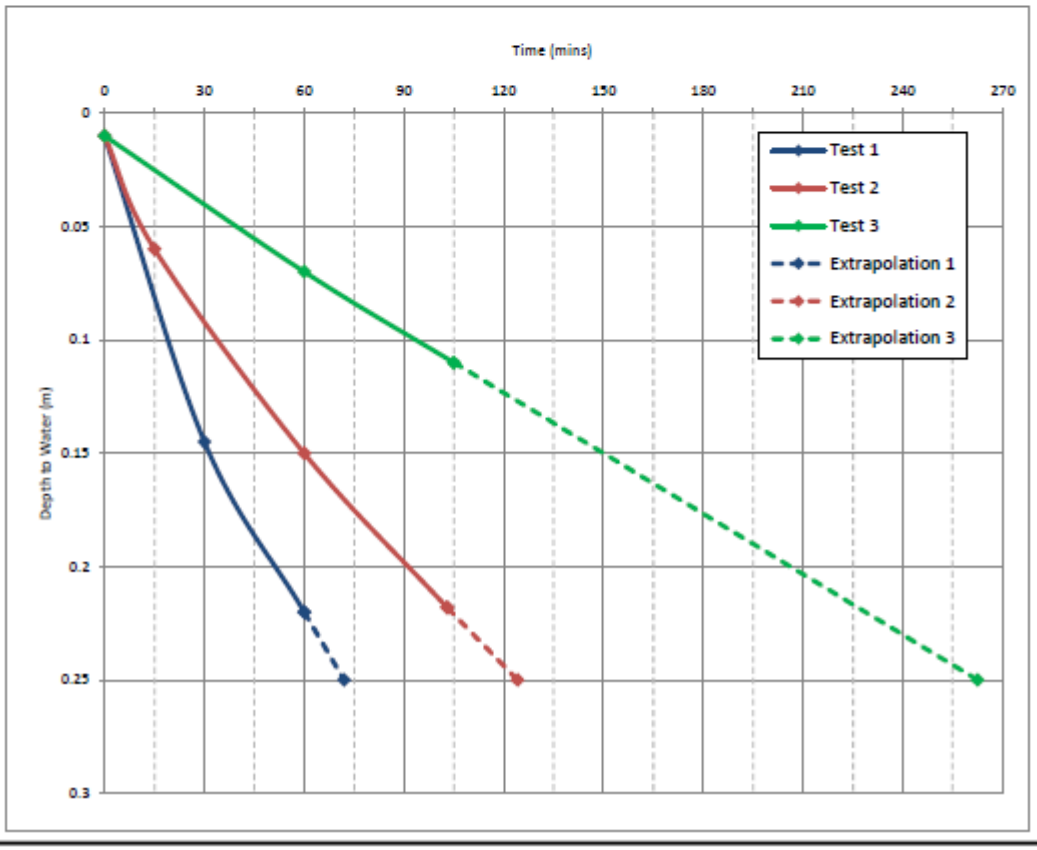
Date of Test: 16/12/2019

Length (m): 0.30 **Width (m):** 0.30 **Depth (m):** 0.33

Remarks: No groundwater encountered.

	Test 1	Test 2	Test 3
Effective Storage Depth$_{75-25\%}$ (m)	0.160	0.160	0.160
t = Time$_{75-25\%}$ (secs)	3195.0	5650.2	10800.0
Vp (s/mm)	19.97	35.31	67.50

Average Extrapolated VP (s/mm)	40.93



Appendix 4 Soakaway Test Results – Surface Water – Soak 1

Intégrale
Understanding Ground Conditions

Suite 7, Westway Farm Business Park
Wick Road
Bishop Sutton
BS39 5XP
Tel: 01275 333 036
www.integrale.uk.com

Job No:	19106	**Soil Infiltration Rate Test**			
		BRE 365 (2007) Soakaway Design			
Job Name:	Jerrings Hall Farm			Hole:	**Soak1**
Prepared By:	JB	Date:	13/01/2020	Sheet:	1 of 1
Checked By:	AH	Date:	13/01/2020		

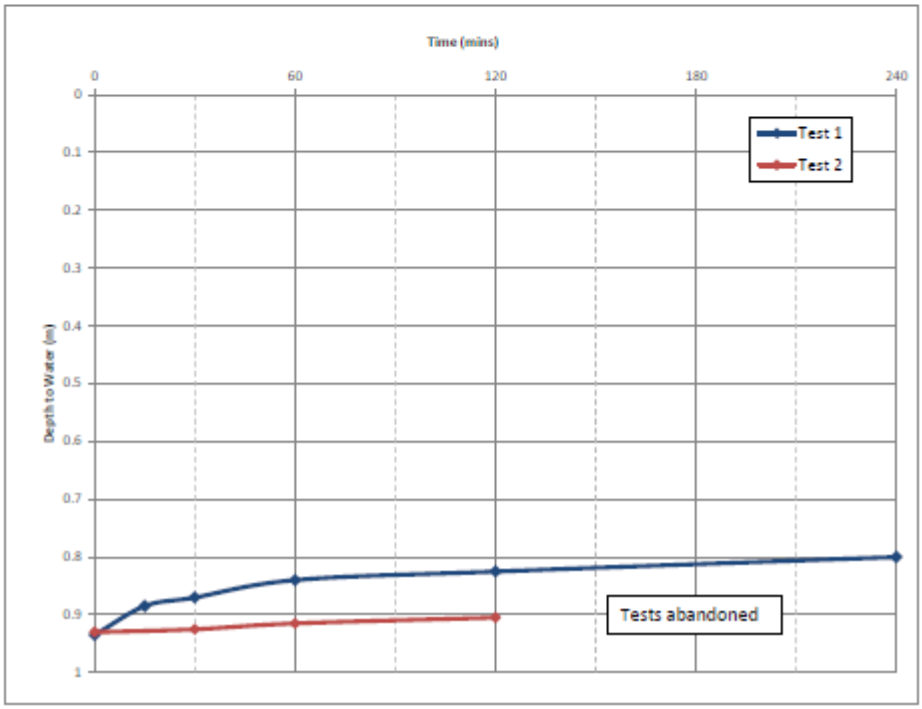
Date of Test: 13/12/19 & 16/12/19

Length (m): 1.00 **Width (m):** 0.60 **Depth (m):** 1.60

Remarks: The superficial soils were saturated and perched groundwater readily flowed into the pit throughout the tests, resulting in increasing water levels..

	Test 1	Test 2	Test 3
Effective Storage Depth$_{75\text{-}25\%}$ (m)	0.33	0.34	-
A = Surface Area$_{50\%}$ (m^2)	1.66	1.66	-
V = Effective Storage Volume$_{75\text{-}25\%}$ (m^3)	0.20	0.20	-
t = Time$_{75\text{-}25\%}$ (mins)	N/A	N/A	-
Soil Infiltration Rate (m/s)	N/A	N/A	-

Soil Infiltration Rate (m/s)	N/A



Soakway Test – Soak2A

Intégrale
Understanding Ground Conditions

Suite 7, Westway Farm Business Park
Wick Road
Bishop Sutton
BS39 5XP
Tel: 01275 333 036
www.integrale.uk.com

Job No:	19106	**Soil Infiltration Rate Test**			
		BRE 365 (2007) Soakaway Design			
Job Name:	Jerrings Hall Farm			Hole:	**Soak2A**
Prepared By:	JB	Date:	13/01/2020	Sheet:	1 of 1
Checked By:	AH	Date:	13/01/2020		

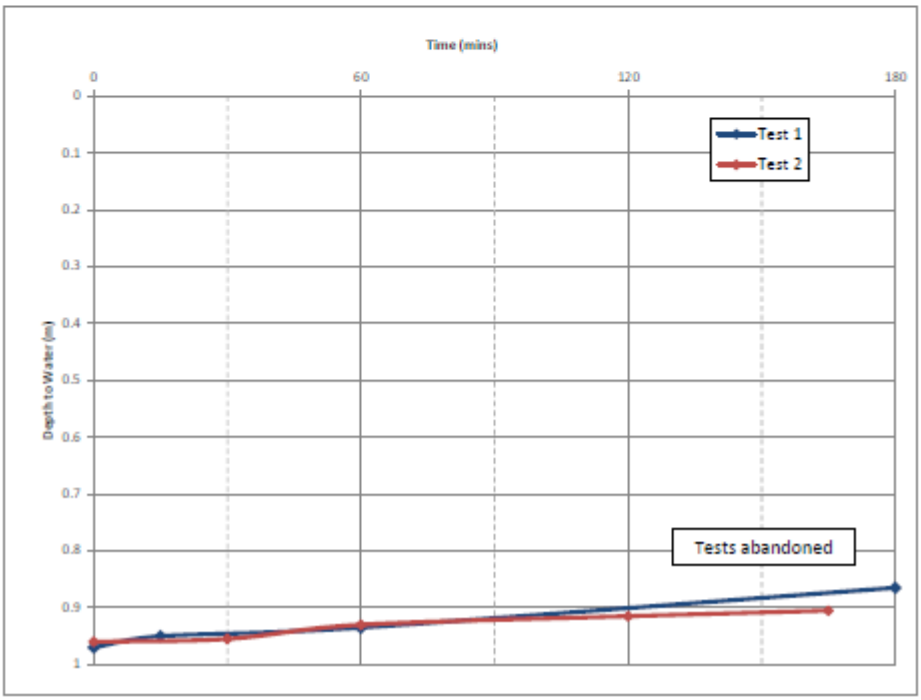
Date of Test: 13/12/19 & 16/12/19

Length (m): 1.50 **Width (m):** 0.60 **Depth (m):** 1.50

Remarks: The superficial soils were saturated and perched groundwater readily flowed into the pit throughout the tests, resulting in increasing water levels.

	Test 1	Test 2	Test 3
Effective Storage Depth$_{75-25\%}$ (m)	0.27	0.27	-
A = Surface Area$_{50\%}$ (m^2)	2.01	2.01	-
V = Effective Storage Volume$_{75-25\%}$ (m^3)	0.24	0.24	-
t = Time$_{75-25\%}$ (mins)	N/A	N/A	-
Soil Infiltration Rate (m/s)	N/A	N/A	-

Soil Infiltration Rate (m/s)	N/A



Soakaway Test – Soak3

Intégrale
Understanding Ground Conditions

Suite 7, Westway Farm Business Park
Wick Road
Bishop Sutton
BS39 5XP
Tel: 01275 333 036
www.integrale.uk.com

Job No:	19106	**Soil Infiltration Rate Test**			
		BRE 365 (2007) Soakaway Design			
Job Name:	Jerrings Hall Farm			Hole:	**Soak3**
Prepared By:	JB	Date:	13/01/2020	Sheet:	1 of 1
Checked By:	AH	Date:	13/01/2020		

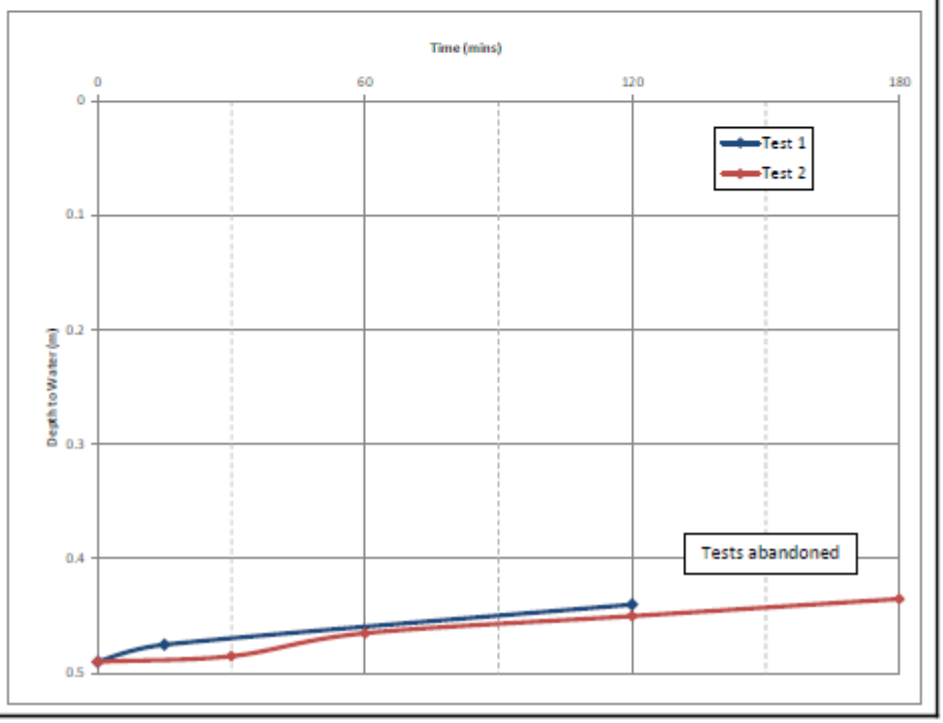
Date of Test: 13/12/19 & 16/12/19

Length (m): 1.40 **Width (m):** 0.85 **Depth (m):** 1.10

Remarks: The superficial soils were saturated and perched groundwater readily flowed into the pit throughout the tests, resulting in increasing water levels.

	Test 1	Test 2	Test 3
Effective Storage Depth$_{75-25\%}$ (m)	0.31	0.31	-
A = Surface Area$_{50\%}$ (m^2)	2.56	2.56	-
V = Effective Storage Volume$_{75-25\%}$ (m^3)	0.36	0.36	-
t = Time$_{75-25\%}$ (mins)	N/A	N/A	-
Soil Infiltration Rate (m/s)	N/A	N/A	-

Soil Infiltration Rate (m/s)	N/A



Soakaway Test – Soak4

Intégrale
Understanding Ground Conditions

Suite 7, Westway Farm Business Park
Wick Road
Bishop Sutton
BS39 5XP
Tel: 01275 333 036
www.integrale.uk.com

Job No:	19106	**Soil Infiltration Rate Test**			
		BRE 365 (2007) Soakaway Design			
Job Name:	Jerrings Hall Farm			Hole:	**Soak4**
Prepared By:	JB	Date:	13/01/2020	Sheet:	1 of 1
Checked By:	AH	Date:	13/01/2020		

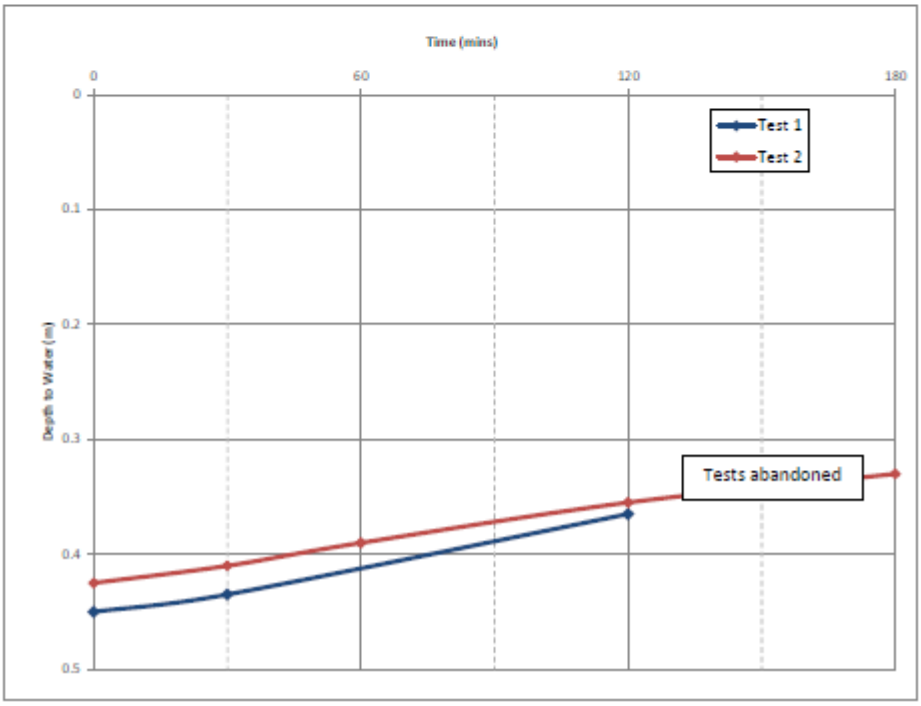
Date of Test: 13/12/19 & 16/12/19

Length (m): 1.10 **Width (m):** 0.60 **Depth (m):** 1.10

Remarks: The superficial soils were saturated and perched groundwater readily flowed into the pit throughout the tests, resulting in increasing water levels.

	Test 1	Test 2	Test 3
Effective Storage Depth$_{75-25\%}$ (m)	0.33	0.34	-
A = Surface Area$_{50\%}$ (m^2)	1.77	1.77	-
V = Effective Storage Volume$_{75-25\%}$ (m^3)	0.21	0.21	-
t = Time$_{75-25\%}$ (mins)	N/A	N/A	-
Soil Infiltration Rate (m/s)	N/A	N/A	-

Soil Infiltration Rate (m/s)	N/A



Soakaway Test – Soak5A

Intégrale
Understanding Ground Conditions

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Job No:	19106	**Soil Infiltration Rate Test**			
		BRE 365 (2007) Soakaway Design			
Job Name:	Jerrings Hall Farm			Hole:	**Soak5A**
Prepared By:	JB	Date:	13/01/2020	Sheet:	1 of 1
Checked By:	AH	Date:	13/01/2020		

Date of Test: 13/12/19 & 16/12/19

Length (m): 1.20 **Width (m):** 0.60 **Depth (m):** 1.60

Remarks: The superficial soils were saturated and perched groundwater readily flowed into the pit throughout the tests, resulting in increasing water levels.

	Test 1	Test 2	Test 3
Effective Storage Depth$_{75-25\%}$ (m)	0.31	0.36	-
A = Surface Area$_{50\%}$ (m^2)	1.85	1.85	-
V = Effective Storage Volume$_{75-25\%}$ (m^3)	0.23	0.23	-
t = Time$_{75-25\%}$ (mins)	N/A	N/A	-
Soil Infiltration Rate (m/s)	**N/A**	**N/A**	-

Soil Infiltration Rate (m/s)	**N/A**