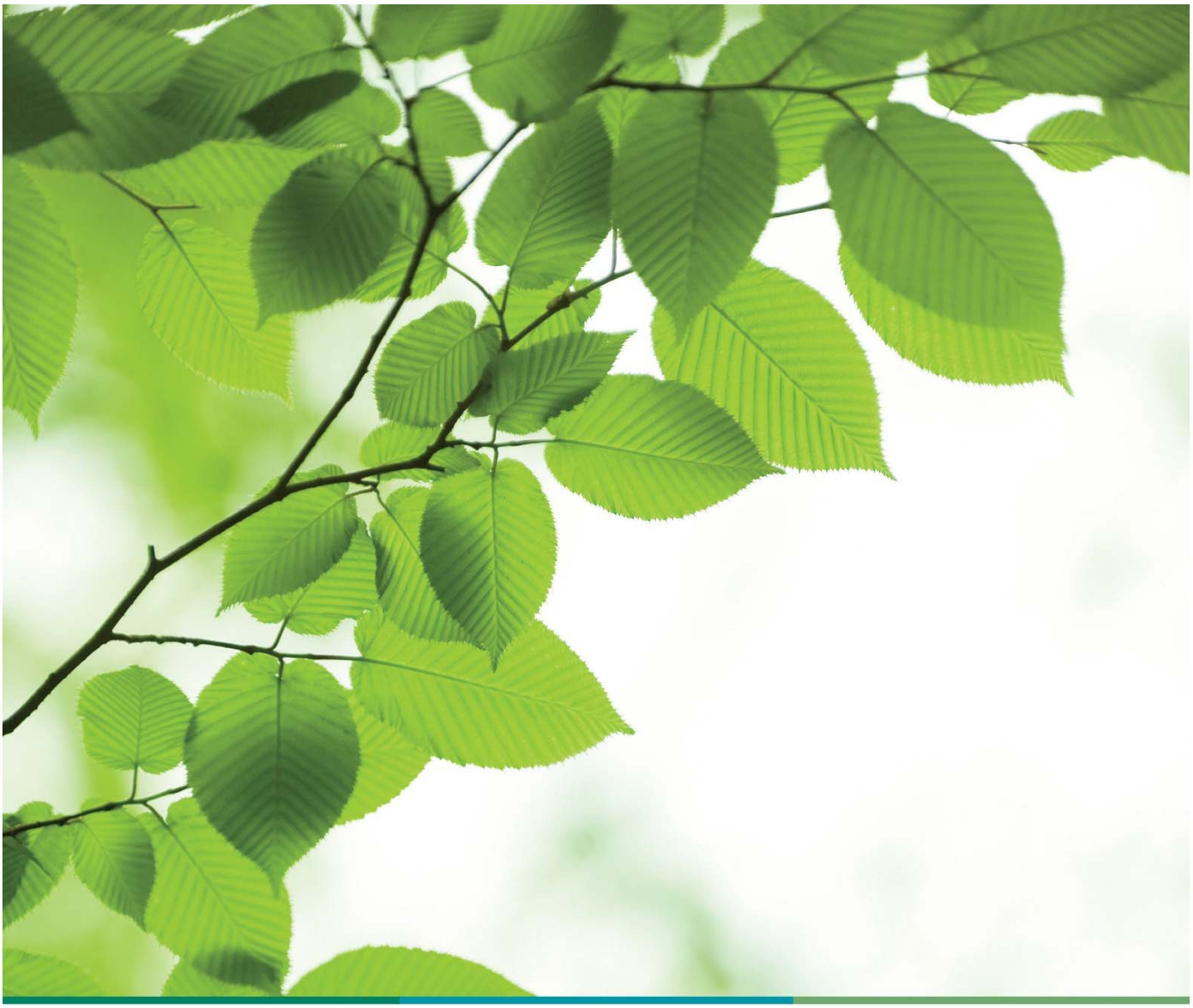

Soakaway and Foul Drainage Testing Report

Woodbine Cottage, Doncaster Road, Billingley

Presented to **Mr Stephen Selway**

Issued: September 2019

Delta-Simons Project No. 19-1049.01

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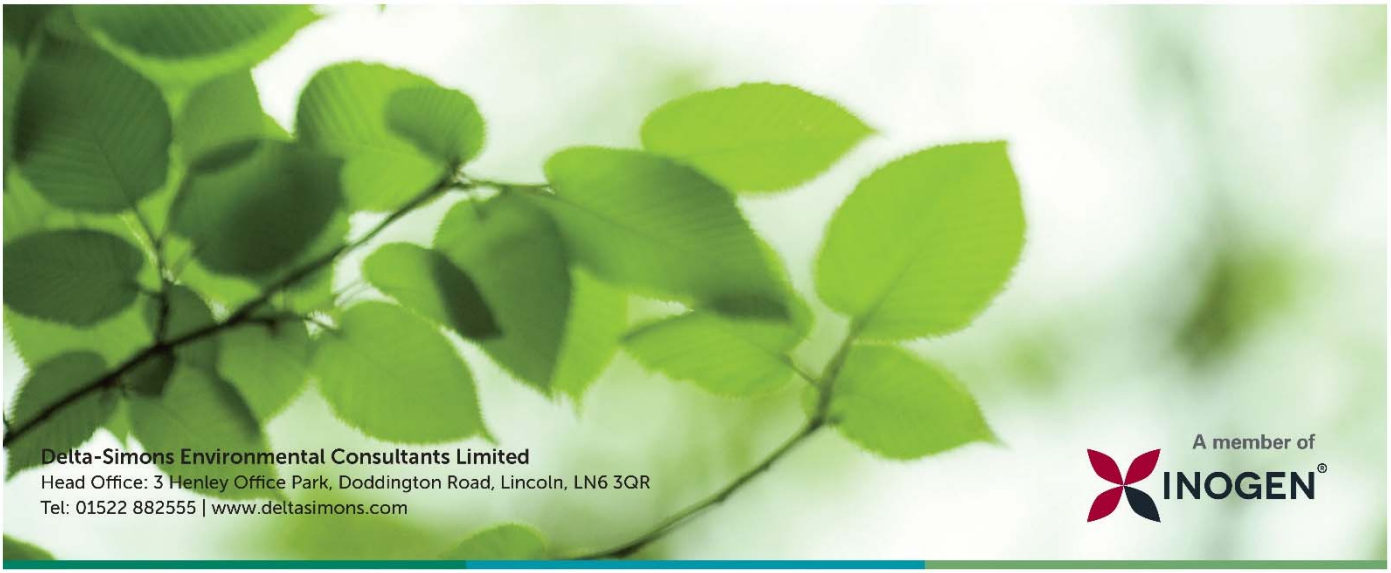

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Report Details

Client	Mr Stephen Selway
Report Title	Soakaway and Foul Drainage Testing Report
Site Address	Woodbine Cottage, Doncaster Road, Billingley, S72 0JE
Project No.	19-1049.01
Report Date	3rd September 2019
Delta-Simons Contact	David Jackson (David.Jackson@deltasimons.com)

Quality Assurance

Issue No.	Status	Issue Date	Comments	Author	Technical Review	Authorised
02	Final	03/09/2019	-			
				Jacob Keeling Graduate Consultant	**David Jackson Principal**	**André Gilleard Associate Director**

About us

Delta-Simons is a trusted, multidisciplinary environmental consultancy, focused on delivering the best possible project outcomes for customers.

Specialising in Environment, Health & Safety and Sustainability, Delta-Simons provide support and advice within the property development, asset management, corporate and industrial markets. Operating from ten locations - Lincoln, Birmingham, Bristol, Dublin, Leeds, London, Manchester, Newcastle, Norwich and Nottingham - we employ over 75 environmental professionals, bringing experience from across the private consultancy and public sector markets.

Delta-Simons is proud to be a founder member of the Inogen® Environmental Alliance, a global corporation providing multinational organisations with consistent, high quality and cost effective environmental, health, safety, energy and sustainability solutions. Inogen assists multinational clients by resolving liabilities from the past, addressing today's requirements and delivering solutions for the future. With more than 200 offices located on every continent, more than 6,430 staff worldwide, and projects completed in more than 120 countries, Inogen provides a single point of contact for diverse markets as Automotive, Chemical, Consumer Products & Retail, Financial, Food & Beverage, Healthcare, Insurance, Manufacturing, Non Profit Organisations, Oil & Gas, Real Estate, Services Firms, Technology and Transportation, among others.

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1.0 Authorisation, Context and Purpose

Delta-Simons Environmental Consultants Limited ('Delta-Simons') has been instructed by Mr Stephen Selway (the Client) to undertake four soakaway drainage tests (SA101 to SA104) and three percolation tests (FD101 to FD103) to provide information for the suitability and design of surface water soakaway and wastewater (foul) discharge solutions for the proposed residential development, on greenfield land associated with Woodbine Cottage, Doncaster Road, Billingley, S72 0JE (hereafter referred to as the 'Site'). The existing Woodbine Cottage is to be retained, and five new residential dwelling constructed to either side of it.

A Site Location Plan and Site Layout Plan are included as Figures 1 and 2 respectively.

Woodbine Cottage's foul water is drained via a Titan Septic tank, with an overflow for the treated waste which discharges to ground via a network of pipes. The tank is in the location of proposed Plot 1 and so will be made redundant by the development. Surface water is drained via a series of soakaways.

The Client requires the testing to accompany submission for outline planning permission.

2.0 Limitations

This Report was prepared by Delta-Simons for the sole and exclusive use of the Client and for the specific purpose for which Delta-Simons was instructed. Nothing contained in this Report shall be construed to give any rights or benefits to anyone other than the Client and Delta-Simons, and all duties and responsibilities undertaken are for the sole and exclusive benefit of the Client and not for the benefit of any other party. In particular, Delta-Simons does not intend, without its written consent, for this Report to be disseminated to anyone other than the Client or to be used or relied upon by anyone other than the Client. Use of the Report by any other person is unauthorised and such use is at the sole risk of the user. Anyone using or relying upon this Report, other than the Client, agrees by virtue of its use to indemnify and hold harmless Delta-Simons from and against all claims, losses and damages (of whatsoever nature and howsoever or whensoever arising), arising out of or resulting from the performance of the work by the Consultant.

3.0 Desktop Information

The Site is indicated to be underlain by bedrock of the Pennine Middle Coal Measures, comprising Carboniferous sandstone, mudstone and siltstone to the south, and predominantly sandstone to the north. No superficial deposits are mapped overlaying bedrock at the Site.

The nearest surface water feature is indicated to be a pond situated approximately 60 m south-west of the Site.

4.0 Investigation

4.1 General

Delta-Simons carried out drainage testing works at the Site from 15th to 16th August 2019. Surface water soakaway tests were undertaken in general accordance with BRE Digest 365 – *Soakaway Design*. Foul water percolation tests were undertaken in general accordance with BS 6297:2007 – *Code of Practice for Design and Installation of Drainage Fields for use in Wastewater Treatment*. Pertinent photos of the works are included as Appendix B.

A total of seven pits were formed, SA101-SA104 and FD101-FD103 (see Figure 3 for approximate locations).

4.2 Identified Ground Conditions

The geology at each trial pit location was logged by the supervising Delta-Simons engineer, with some of the logs given on the soakaway sheets in Appendix A.

Topsoil, typically comprising grass over very soft dark brown slightly sandy slightly gravelly CLAY with fine rootlets, was identified in all test locations (except SA104) from ground level up to a maximum depth of 0.3 m bgl (SA103).

Made Ground was identified in several locations (SA101, SA102, SA104, FD101 to FD103), up to a maximum depth of 0.65 m bgl (SA101, SA104 and FD102). Within SA101 / FD101, Made Ground was typically comprised of slightly clayey very gravelly SAND. Gravel was angular to subangular fine to coarse of concrete, red brick fragments, sandstone and rare plastic fragments, with frequent angular to subangular cobbles of concrete, red brick and sandstone (suspected demolition rubble). Within SA102 / FD102, Made Ground was typically comprised of slightly gravelly sandy CLAY. Gravel was angular to subangular of red brick fragments, sandstone and mudstone, with rare cobbles of red brick and sandstone (suspected to be reworked natural deposits). Within SA104, Made Ground was typically comprised of sandy slightly gravelly CLAY. Gravel was angular to subangular fine to coarse of red brick fragments, sandstone, mudstone and rare plastic (suspected to be reworked natural deposits).

The **underlying natural soils** were variable in composition and depth across the Site, with changeable cobble contents, as follows:

- Within SA101 / FD101, natural strata were encountered from 0.65 and 0.55 m bgl, respectively, generally comprising slightly clayey gravelly SAND and slightly sandy gravelly CLAY. Weathered bedrock was encountered at 1.5 m bgl in SA101 (proven to a maximum depth of 2.3 m bgl), comprising slightly clayey very sandy GRAVEL of sandstone, with frequent cobbles of sandstone.
- Within SA102 / FD102, natural strata were encountered from 0.6 and 0.65 m bgl, respectively, generally comprising slightly clayey sandy GRAVEL of sandstone, with occasional cobbles of sandstone. Weathered bedrock was encountered at 1.1 m bgl in SA102, comprising very clayey sandy GRAVEL of siltstone and sandstone, which became dominated by siltstone at 1.7 m bgl (proven to a maximum depth of 2.0 m bgl).
- Within SA103 / FD103, natural strata were encountered at 0.4 and 0.3 m bgl, respectively, generally comprising slightly sandy CLAY. Weathered bedrock was encountered at 1.4 m bgl in SA103, comprising slightly clayey very sandy GRAVEL of siltstone, which contained frequent angular to subangular cobbles of siltstone from 1.9 m bgl (proven to a maximum depth of 2.6 m bgl).
- Within SA104, natural strata were encountered at 0.65 m bgl, comprising sandy slightly gravelly CLAY and sandy CLAY. Weathered bedrock was encountered at 2.7 m bgl in SA104 (proven to a maximum depth of 3.0 m bgl), comprising clayey sandy GRAVEL of mudstone and siltstone, with frequent angular to subangular cobbles of mudstone and siltstone.

Given the observed ground conditions, the natural soils and underlying bedrock lithologies are considered to be variable across the Site, but below 1.1 to 2.7 metres below existing ground level (m begl) there was gravel with secondary components of clay, sand and cobbles in varying quantities.

Typically, weathered sandstone, weathered siltstone and weathered mudstone are present in the north-east, central and western parts of the Site respectively, underlying variable thicknesses and compositions of Topsoil and Made Ground.

4.3 Groundwater Conditions

The seven pits were excavated to a maximum depth of 3.0 m begl and were left open for a number of hours. No groundwater ingress was noted within that maximum depth and so groundwater is considered to be deeper than 3.0 m begl.

To provide the best design for surface water soakaways, the installation of groundwater monitoring wells and subsequent monitoring would be prudent (boreholes are likely to be required at the Site in future, in order to prove no risk from coal mining; therefore, wells could be installed at that stage).

4.4 Surface Water Soakaway Tests

Soakaway testing included the excavation of four trial pits (SA101 to SA104) up to a maximum depth of 3.0 m bgl (SA104). Approximately one tonne of gravel, as well as monitoring pipes, were then installed in each trial pit. The remaining spoil was then used to backfill the remainder of the test pit.

The gravel pack in each test location was filled with water from an IBC three times, and the depth to water from ground level recorded at intervals over a period of up to 25 minutes.

The soakage test data was recorded and used to calculate the soil infiltration rate for each location.

4.5 Foul Drainage Percolation Tests

Percolation testing included the excavation of three trial pits (FD101 to FD103) up to a maximum depth of 0.8 m bgl. At the base of each trial pit, a hand pit was excavated with dimensions of 0.3 x 0.3 x 0.3 m, making overall pit depths a maximum of 1.1 m bgl. Approximately 50 mm of gravel was placed at the base of each hand pit, which was then filled with 300 mm of water, from a bucket, at least three times. The time in which it took the water to drain from 75% to 25% of the original 300 mm thickness was then recorded.

The percolation test data was then used to calculate the percolation value (*Vp*)(seconds/mm) for each location, using the following formula:

$$Vp = \frac{[time\ taken\ in\ seconds\ for\ the\ water\ to\ drain\ from\ 75\%\ to\ 25\%]}{[thickness\ of\ water\ in\ millimetres\ from\ 75\%\ to\ 25\%]}$$

5.0 Soakaway Test Results

Test data is provided in Appendix A and summarised in Table 1 below. The approximate locations of the Soakage Tests are presented on Figure 3.

Table 1: Summary of Soakaway Testing in General Accordance with BRE 365

Soakaway Test Location I.D.	Test Depth Range (m bgl)	Response Zone Thickness (m)	Recommended Soil Infiltration Rate (ms^{-1})	Geology
SA101	1.5 – 2.3	0.8	9.7×10^{-5}	Slightly clayey very sandy angular to subangular fine to coarse GRAVEL of sandstone. Frequent angular to subangular cobbles of sandstone.
SA102	1.4 – 2.0	0.6	1.5×10^{-4}	Clayey sandy angular to subangular fine to coarse GRAVEL of siltstone.
SA103	1.8 – 2.6	0.8	1.9×10^{-4}	Slightly clayey very sandy angular to subangular fine to coarse GRAVEL of siltstone. Frequent angular to subangular cobbles of siltstone.
SA104	2.4 – 3.0	0.6	1.3×10^{-4}	Clayey sandy angular to subangular fine to coarse GRAVEL of mudstone and siltstone. Occasional angular to subangular cobbles of mudstone and siltstone.

: Pass : Fail

Given the calculated infiltration rates, Delta-Simons consider surface water soakaways to be feasible for the Site at the tested locations and depths outlined above.

6.0 Percolation Test Results

6.1 Results

Test data is summarised in Table 2 below, with a *Vp* of <12 or >100 being a fail. The approximate locations of the Percolation Tests are presented on Figure 3.

Table 2: Summary of Percolation Testing in General Accordance with BS 6297:2007

Percolation Test Location I.D.	Test Depth Range (m bgl)	Response Zone Thickness (m)	Percolation Value [Vp] (sec/mm)	Geology
FD101	0.8 – 1.1	0.3	27.8	Clayey gravelly fine to medium SAND.
FD102	0.65 – 0.95	0.3	10.7	Slightly clayey sandy angular to subangular fine to medium GRAVEL of sandstone.
FD103	0.8 – 1.1	0.3	16.0	Sandy slightly gravelly CLAY.

: Pass : Fail

Given the calculated percolation values, Delta-Simons consider wastewater discharge to be feasible for the Site at two of the tested locations (FD101 and FD103) and associated depths outlined above.

The percolation test conducted in FD102 marginally failed due to the average percolation rate exceeding the maximum acceptable value required for foul drainage fields, specified in BS 6297: 2007 as *Vp* > 12 sec/mm. The FD102 test was conducted in a slightly clayey sandy GRAVEL of sandstone, which is likely to have facilitated the rapid drainage. However, based upon the soils encountered in the adjacent soakaway (SA102), at 1.1 to 2.0 m bgl a very clayey sandy GRAVEL of siltstone is anticipated to be present. The potential underlying siltstone gravel may reduce the percolation rate enough to meet the *Vp* > 12 sec/mm requirement.

6.2 Foul Drainage Options & Outline Design

The options for foul water drainage are:

1. **Drain to a nearby sewer** – However the nearest combined sewer is 645 m to the east, making this option impractical.

2. Pass foul water through a **high specification *Package Treatment Plant*** **(PTP) and Discharge to a nearby surface watercourse** that contains flowing water 24/7 - There is a drainage ditch to the south although this necessitates crossing third party land so is unlikely to provide a viable solution.

3. Pass foul water through a **high specification PTP and Discharge to soakaways that are normally used for surface water drainage –** probably the most viable option and requires design by the PTP supplier and the project's civil/drainage engineer.

4. Pass foul water through a **low specification PTP and Discharge to the ground via a drainage field –** a viable option, but drainage fields are not permitted to be built over, nor trafficked, even by foot (as such can risk compacting the soils and over time could adversely reduce drainage rates. This would mean sterilising such parts of the site. In discussion with the LA, it may however be permitted to employ say geotextile grids above the drainage field to reduce/remove the compaction by foot and therefore bring such areas back into say garden use.

Individual proprieties could have their own PTPs to make responsibility and costs for maintenance, clearer. Or there could be one PTP serving the whole site, which should be cheaper, but would require each homeowner to enter into a maintenance (and cost) agreement.

PTPs require routine cleaning out (hence costs), the intervals for which varying significantly depending on the specification for the PTP, i.e. high specification plants require less frequent cleaning vs lower specifications plants. PTPs must be located where tankers can reach such to empty them.

Importantly, the client must note that drainage fields do eventually silt up and require excavating and rebuilding.

Given all of the above, then Option (3) remains the most viable option. If the client wishes to consider Option (4) then Delta-Simons can provide an outline design, but such would only duplicate the specification for drainage fields given in BS6297 and Building Regulations Approved Document H (e.g. the drainage field pipes being laid to a 1:200 slope, no shallower than 0.2 m begl and >1.2 m above the shallowest seasonal groundwater level.

7.0 Conclusions

Based upon the information obtained during the investigation, ground conditions are considered to be variable across the Site, with varying occurrences of weathered mudstone, siltstone and sandstone being recorded, as would be anticipated for the Pennine Middle Coal Measures.

It was noted that the north-east corner of the Site was underlain by weathered sandstone, whilst the middle and western parts of the Site were predominantly underlain by weathered siltstone and mudstone respectively. Consequently, variable drainage rates would be anticipated in such strata.

Given the drainage testing results, Delta-Simons consider surface water soakaways to be suitable in all the locations at the depths tested (SA101 to SA104), situated in the north-east, south-east, south-west and centre of the Site.

Wastewater discharge to a drainage field is considered to be suitable in the ground at the depths tested within FD101 and FD103, situated in the north-east and centre of the Site respectively. The average percolation value in FD102 exceeded the maximum rate acceptable under BS 6297:2007; however, given the less permeable siltstone gravel anticipated at approximately 1.1 m bgl, percolation rates may be reduced enough to be acceptable at that location at such depths. Further investigation would be required to support this assumption (i.e. to refine any initial designs). A more viable option appears to be use of a / some high specification PTP(s) discharging to a soakaway(s).

Drawing 1 – Proposed Site Layout (No. 2019/08/02)

proposed site layout at 1:200

The concept behind the proposal, takes a lead from the idea of a converted former farmstead reflecting a logical architectural hierarchy.

Woodbine Cottage being the 'main two storey farmhouse' (first tier).

The cottage alongside having more modest architectural embellishment, (the second tier).

The 'courtyard' a group of two storey and single storey buildings, (third tier).

REVISIONS

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CLIENT
Stephen and Jayne Selway

PROJECT
Proposed residential development of 5 no dwellings

LOCATION
Woodbine Cottage, Doncaster Road, Billingley, Barnsley S72 0JE

DRAWING
Proposed site layout

SCALES 1:200 DATE Mar' 19

DRWG No. 2019/08/02 REV.

DRAWN BY PD

Figure 1 – Site Location Map

LEGEND

Site Boundary

Scale: 1:10000 @ A4

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Environment - Health & Safety - Sustainability

TITLE:
Site Location Map
Woodbine Cottage
Doncaster Road

DRAWN BY:	SCALE (@A4):	PROJECT NO:
RB	1:10000	19-1049
CHECKED BY:	REVISION:	FIGURE NO:
JK	-	1
DATE:		
19 August 2019		

Figure 2 – Site Layout Plan

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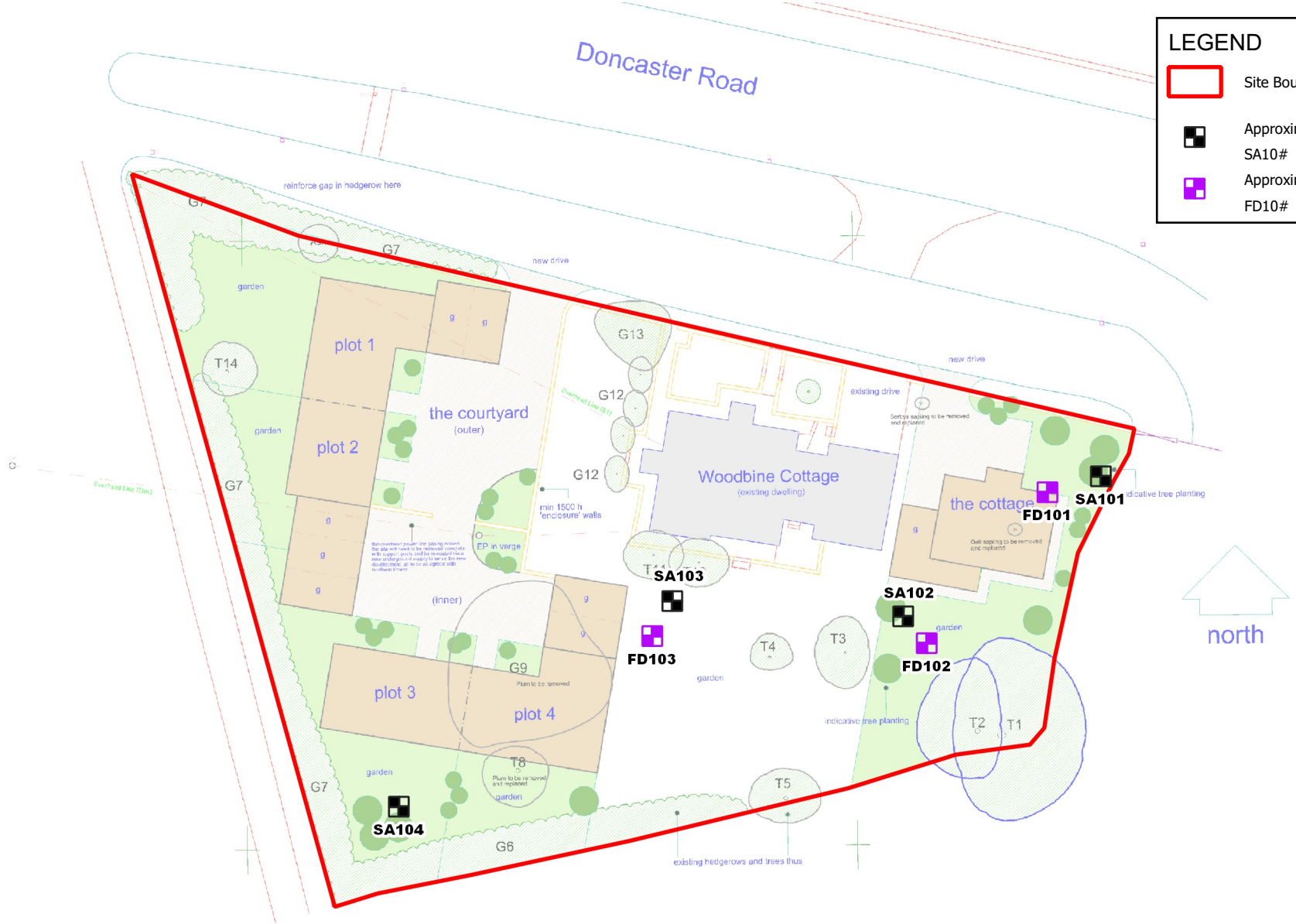
Environment - Health & Safety - Sustainability

TITLE:
Site Layout Plan
Woodbine Cottage
Doncaster Road

DRAWN BY: RB	SCALE (@A4): 1:1000	PROJECT NO: 19-1049.01	
CHECKED BY: JK	REVISION: -	FIGURE NO: 2	
DATE: 19 August 2019			

Figure 3 – Exploratory Hole Location Plan



LEGEND

- Site Boundary
- Approximate Soakaway Test Pit Location SA10#
- Approximate Foul Drainage Test Pit Location FD10#

Site Plan Provided by Client. Modified by Delta-Simons.

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TITLE:
Exploratory Hole Location Plan
Woodbine Cottage
Doncaster Road

DRAWN BY:	SCALE (@A4):	PROJECT NO:
RB	1:500	19-1049.01
CHECKED BY:	REVISION:	FIGURE NO:
JK	-	3
DATE: 19 August 2019		

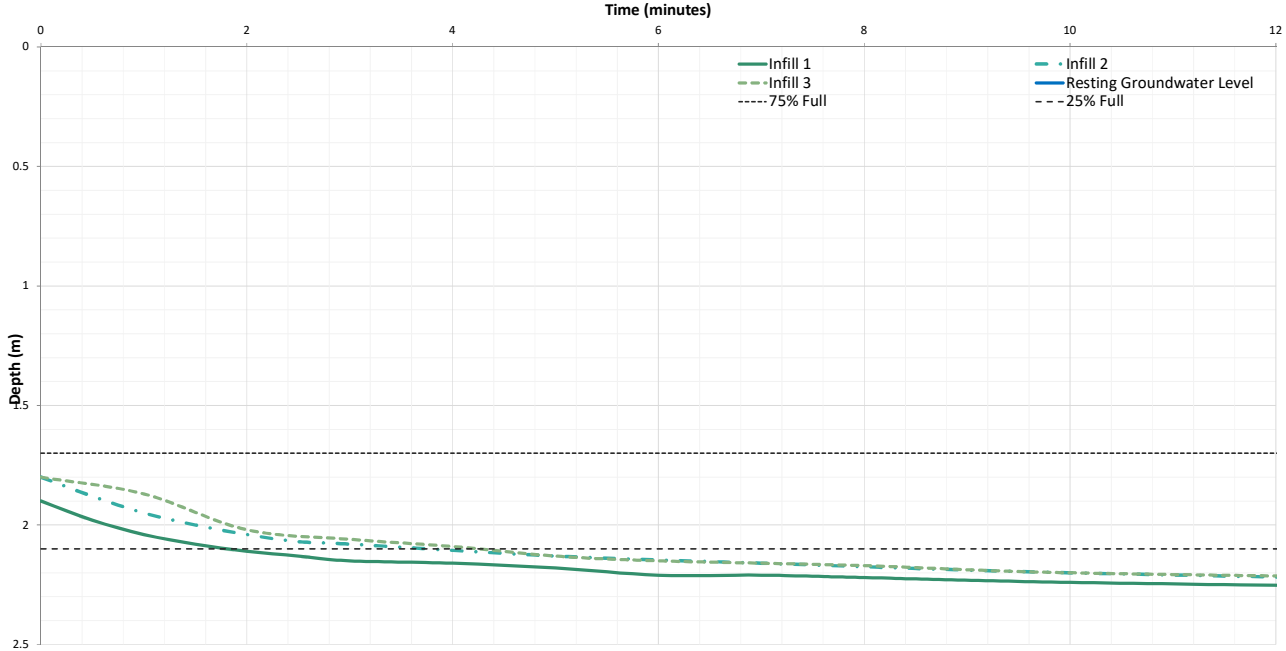
Appendix A – BRE 365 Soakaway Infiltration Test Results

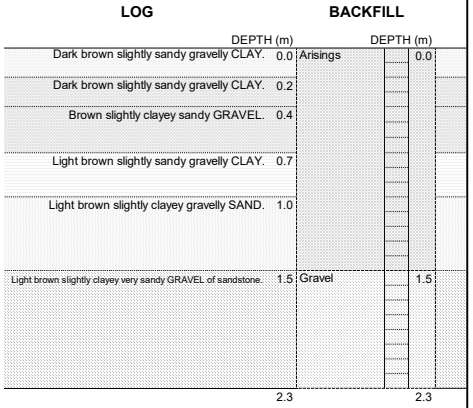
	units	Infill 1	Infill 2	Infill 3
Length	m		2.20	
Width	m		0.60	
Depth	m		2.30	
Gravel type			Standard	
Voids ratio			0.35	
Resting groundwater level at time of testing	m		DRY	
Depth of first reading	m	1.90	1.80	1.80
Depth of final reading	m	2.30	2.30	2.30
Did soakage test reach 25% of maximum fill depth?		Yes	Yes	Yes
Did soakage test reach near empty?		Yes	Yes	Yes
Depth at 75% full/effective depth	m	2.00	1.93	1.93
Depth at 25% full/effective depth	m	2.20	2.18	2.18
Time at 75% full/effective depth	mins	0.67	0.82	1.37
Time at 25% full/effective depth	mins	5.67	8.12	8.33
Vp75 - 25 (volume outflowing between 75% and 25% full/effective depth)	m^3	0.09	0.12	0.12
Mean surface area for outflow (50% full/effective depth)	m^2	2.44	2.72	2.72
tp75 (time for the water level to fall from 75% to 25% full/effective depth)	mins	5.00	7.30	6.97
Soil infiltration rate, f =	m/s	0.00012623	0.00009690	0.00010159
or	m/s	1.3E-04	9.7E-05	1.0E-04

Recommended soil infiltration rate

9.7E-05	m/s

Note:
Where water level reaches nearly empty (5% full), soil infiltration based on 'Full' depth. Where water level did not reach nearly empty (5% full), soil infiltration rate is based on 'Effective' drainage achieved only. Where water level did not fall below 25% of the maximum fill level, this is considered to be a 'Failed' test.





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TITLE: Soakaway Test Results
Woodbine Cottage, Billingley

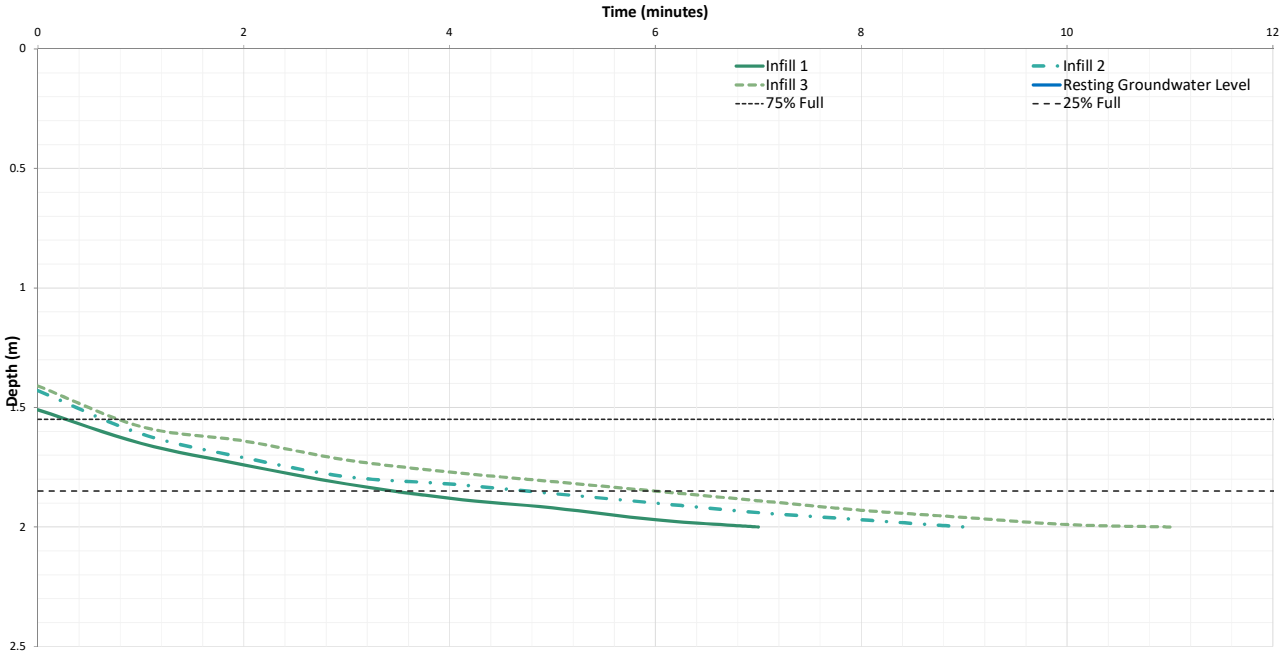
In accordance with BRE Digest 365 (2016)

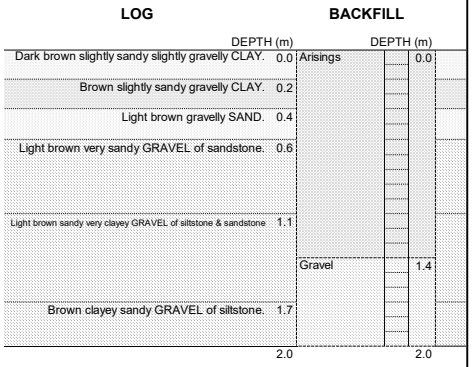
DRAWN BY: JK	SCALE: Not to Scale	PROJECT NUMBER: 19-1049.01	
CHECKED BY: DJ	REVISION: 1	SOAKAWAY NUMBER: SA101	
DATE: 15/08/2019			

	units	Infill 1	Infill 2	Infill 3
Length	m		2.20	
Width	m		0.60	
Depth	m		2.00	
Gravel type			Standard	
Voids ratio			0.35	
Resting groundwater level at time of testing	m		DRY	
Depth of first reading	m	1.51	1.43	1.41
Depth of final reading	m	2.00	2.00	2.00
Did soakage test reach 25% of maximum fill depth?		Yes	Yes	Yes
Did soakage test reach near empty?		Yes	Yes	Yes
Depth at 75% full/effective depth	m	1.63	1.57	1.56
Depth at 25% full/effective depth	m	1.88	1.86	1.85
Time at 75% full/effective depth	mins	0.88	0.79	0.87
Time at 25% full/effective depth	mins	3.96	4.94	6.06
Vp75 - 25 (volume outflowing between 75% and 25% full/effective depth)	m^3	0.11	0.13	0.14
Mean surface area for outflow (50% full/effective depth)	m^2	2.69	2.92	2.97
tp75 (time for the water level to fall from 75% to 25% full/effective depth)	mins	3.08	4.15	5.19
Soil infiltration rate, f =	m/s	0.00022728	0.00018152	0.00014713
or	m/s	2.3E-04	1.8E-04	1.5E-04

Recommended soil infiltration rate	
1.5E-04	m/s

Note:
Where water level reaches nearly empty (5% full), soil infiltration based on 'Full' depth. Where water level did not reach nearly empty (5% full), soil infiltration rate is based on 'Effective' drainage achieved only. Where water level did not fall below 25% of the maximum fill level, this is considered to be a 'Failed' test.





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TITLE: Soakaway Test Results
Woodbine Cottage, Billingley

In accordance with BRE Digest 365 (2016)

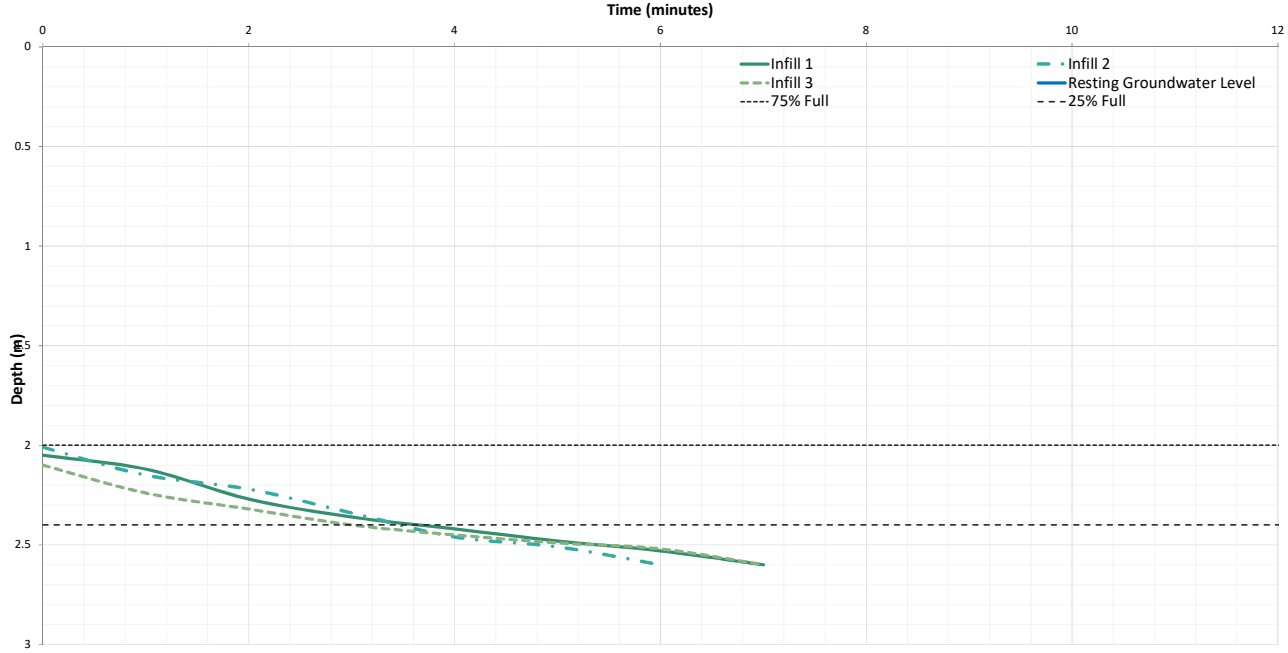
DRAWN BY: JK	SCALE: Not to Scale	PROJECT NUMBER: 19-1049.01	
CHECKED BY: DJ	REVISION: 1	SOAKAWAY NUMBER: SA102	
DATE: 15/08/2019			

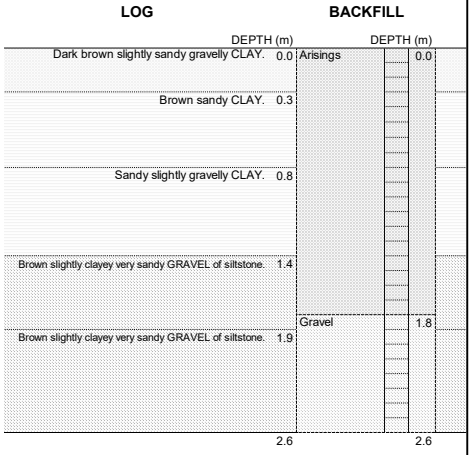
	units	Infill 1	Infill 2	Infill 3
Length	m		2.20	
Width	m		0.60	
Depth	m		2.60	
Gravel type			Standard	
Voids ratio			0.35	
Resting groundwater level at time of testing	m		DRY	
Depth of first reading	m	2.05	2.01	2.10
Depth of final reading	m	2.60	2.60	2.60
Did soakage test reach 25% of maximum fill depth?		Yes	Yes	Yes
Did soakage test reach near empty?		Yes	Yes	Yes
Depth at 75% full/effective depth	m	2.19	2.16	2.23
Depth at 25% full/effective depth	m	2.46	2.45	2.48
Time at 75% full/effective depth	mins	1.45	1.11	0.89
Time at 25% full/effective depth	mins	4.71	3.94	4.63
Vp75 - 25 (volume outflowing between 75% and 25% full/effective depth)	m^3	0.13	0.14	0.12
Mean surface area for outflow (50% full/effective depth)	m^2	2.86	2.97	2.72
tp75 (time for the water level to fall from 75% to 25% full/effective depth)	mins	3.26	2.83	3.73
Soil infiltration rate, f =	m/s	0.00022723	0.00027004	0.00018963
or	m/s	2.3E-04	2.7E-04	1.9E-04

Recommended soil infiltration rate

1.9E-04	m/s

Note:
Where water level reaches nearly empty (5% full), soil infiltration based on 'Full' depth. Where water level did not reach nearly empty (5% full), soil infiltration rate is based on 'Effective' drainage achieved only. Where water level did not fall below 25% of the maximum fill level, this is considered to be a 'Failed' test.





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TITLE: Soakaway Test Results
Woodbine Cottage, Billingley

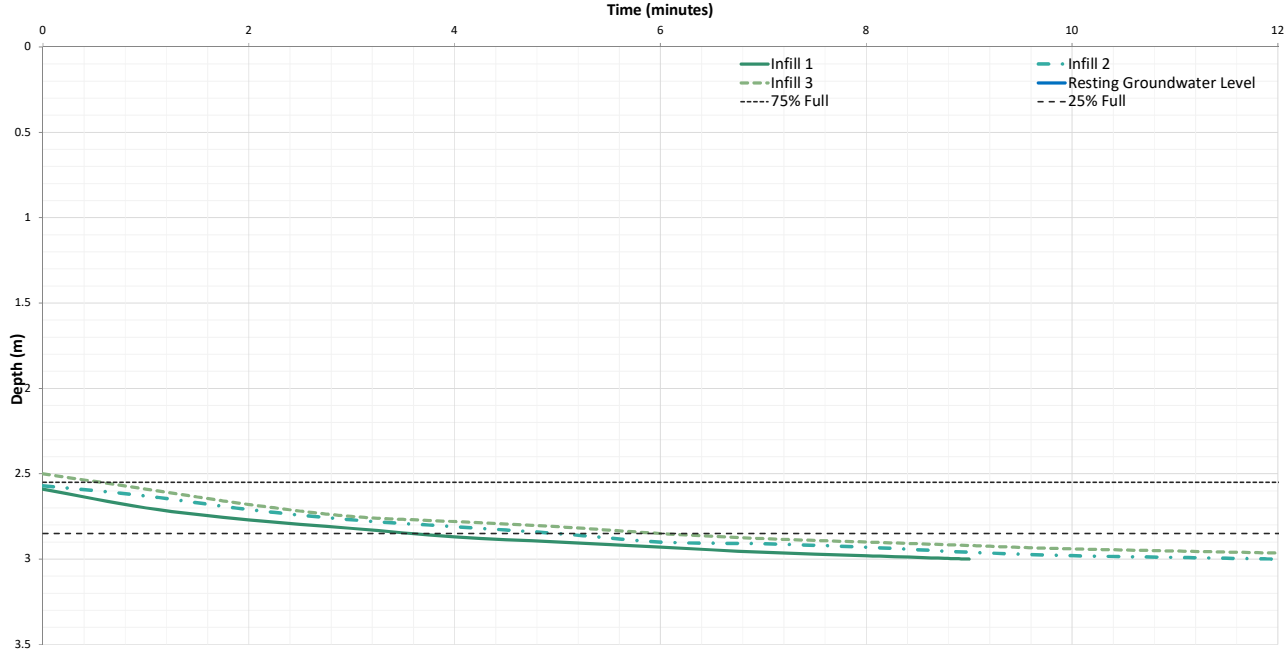
In accordance with BRE Digest 365 (2016)

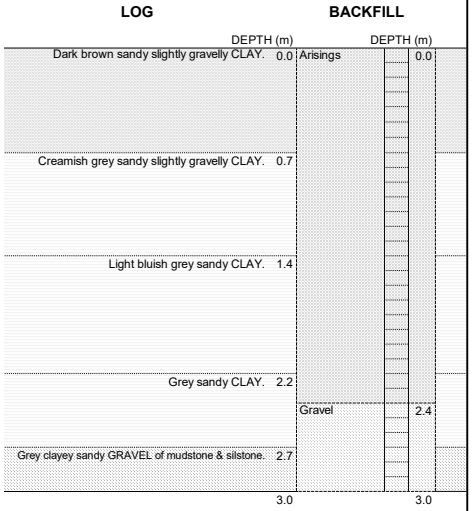
DRAWN BY: JK	SCALE: Not to Scale	PROJECT NUMBER: 19-1049.01
CHECKED BY: DJ	REVISION: 1	SOAKAWAY NUMBER: SA103
DATE: 15/08/2019		

	units	Infill 1	Infill 2	Infill 3
Length	m		2.20	
Width	m		0.60	
Depth	m		3.00	
Gravel type			Standard	
Voids ratio			0.35	
Resting groundwater level at time of testing	m		DRY	
Depth of first reading	m	2.59	2.57	2.50
Depth of final reading	m	3.00	3.00	3.00
Did soakage test reach 25% of maximum fill depth?		Yes	Yes	Yes
Did soakage test reach near empty?		Yes	Yes	Yes
Depth at 75% full/effective depth	m	2.69	2.68	2.63
Depth at 25% full/effective depth	m	2.90	2.89	2.88
Time at 75% full/effective depth	mins	0.93	1.59	1.39
Time at 25% full/effective depth	mins	4.92	5.85	6.83
Vp75 - 25 (volume outflowing between 75% and 25% full/effective depth)	m^3	0.09	0.10	0.12
Mean surface area for outflow (50% full/effective depth)	m^2	2.47	2.52	2.72
tp75 (time for the water level to fall from 75% to 25% full/effective depth)	mins	3.98	4.26	5.44
Soil infiltration rate, f =	m/s	0.00016050	0.00015410	0.00012999
or	m/s	1.6E-04	1.5E-04	1.3E-04

Recommended soil infiltration rate	
1.3E-04	m/s

Note:
Where water level reaches nearly empty (5% full), soil infiltration based on 'Full' depth. Where water level did not reach nearly empty (5% full), soil infiltration rate is based on 'Effective' drainage achieved only. Where water level did not fall below 25% of the maximum fill level, this is considered to be a 'Failed' test.





deltasimons

TITLE: Soakaway Test Results=
Woodbine Cottage, Billingley=

In accordance with BRE Digest 365 (2016)

DRAWN BY: JK	SCALE: Not to Scale	PROJECT NUMBER: 19-1049.01	
CHECKED BY: DJ	REVISION: 1	SOAKAWAY NUMBER: SA104	
DATE: 15/08/2019			

Appendix B – Site Photographs

Site Photographs

Photograph 1 – Excavation of SA101 to 2.3 m bgl. Facing approximately south.

Photograph 2 – View at the base of SA101 (2.3 m bgl). Made Ground is present up to 0.65 m bgl, with weathered sandstone bedrock being encountered at 1.5 m bgl. Facing approximately south-east.

Photograph 3 – Soakaway installation in SA101. Pipework and gravel are being placed, with the gravel pack filling the trial pit from 2.3 to 1.5 m bgl.

Photograph 4 – Backfilling of SA101 with arisings from 1.5 m bgl to ground level. Facing approximately south-east.

Photograph 5 – Position of FD101 (left of image) in relation to SA101 (top right of image). Demolition rubble excavated from FD101 can be seen stockpiled to the left of the hole. Facing approximately north.

Photograph 6 – View of the 0.3 x 0.3 x 0.3 m hand pit excavated at the base of the FD101 trial pit, from 0.8 to 1.1 m bgl.

Photograph 7 – View of percolation testing being conducted in the base of FD101, from 0.8 to 1.1 m bgl. Facing approximately north.