INGENT
CONSULTING ENGINEERS

FLOOD RISK ASSESSMENTS

Flood Risk Assessment and Drainage Strategy Addendum

2010-493 Chalk Hill, Blakenham

November 2020

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1. INTRODUCTION

1.1 Background

A Flood Risk Assessment (FRA) and Drainage Strategy was produced by Geosphere Environmental to support a planning application for 7 residential dwellings to the west of Hook Drive, Blakenham, reference 4954,DS,FR,FLOOD/PC,SG/12-08-20/V1 dated August 2020. The FRA was submitted in support of a planning application DC/20/01927 and a holding Objection was received from the Lead Local Flood Authority (LLFA) dated 21st August 2020.

The reason given for the LLFA Objection is summarised as:

The reason why we recommend continuing to maintain our holding object is whilst the applicant has provide an assessment of the flood risk to the site, in which they have identified that parts of the site are at medium to high risk of surface water. The applicant has not sufficiently demonstrated that the properties will remain safe for their life time and that they will not increase flood risk elsewhere in line with national and local policy/guidance.

And additional information requested was:

To overcome our objection the applicant shall;

1) Demonstrate with clear evidence how the properties will remain safe for there lifetime and demonstrate that they will not increase surface water flooding elsewhere

2) Reduce the number of dwellings proposed or position the proposed dwellings in a low flood risk area of the site

3) Provided a detailed strategy with evidence, for the disposal of surface water as per our consultation reply dated the 21 st May 2020

1.2 Existing Flood Risk Assessment

The Geosphere FRA does identify the Low to High risk of overland surface water flooding to the site and the flood mapping is included in Appendix A. The preliminary site layout did include a dwelling in the area affected by surface water and in section 5.3 of the FRA it is recommended that mitigation measures must be incorporated into the layout for the proposed development.

The FRA also advises that infiltration measures are likely to be suitable for the site and advises testing to BRE365 to confirm for drainage design.

The purpose of this Addendum is therefore to progress the recommendations of the FRA in order to address the objections raised by the LLFA.

2. SURFACE WATER FLOOD RISK AND DRAINAGE

2.1 Overland Surface Water Flood Risk

As indicated on appended flood mapping and within the FRA, overland surface water flooding can be seen to build up within the north eastern area of the site, within a low area of the topography.

When flood risk is high and greater than 3.3% the floodwater is shown to be solely within the site, but as the risk progresses to less frequent low risk between 0.1% and 1.0% it can be seen that storm water is also expected to flow in from Chalk Hill Lane. The flood water is shown to terminate in the site and this is indicative that the water ponds into the low area of the site in storms before infiltrating over time.

BRE 365 testing has been undertaken on the site to inform this Addendum and in the area of the flood water, rates of 2.19x10-6m/s were found.

In order to mitigate the flood risk from this surface water it is therefore proposed to remove the proposed dwelling previously shown completely within the flood area and to replace it with an excavated infiltration basin to intercept and store the water. A further measure of around 30m of French drain in the floor of the basin is also proposed to help the stored water to infiltrate during and after the storm event. It is recommended that the basin is landscaped to assist with bioretention and also to provide an area of ecological and amenity value within the site.

The basin shown on attached layout drawing 2010-493-SK001 has an excavated volume of 300m3 and it is proposed that suitable material from this excavation will be used to raise the south eastern end of the unmitigated flood area around plot 3, and to raise it by up to 600mm. With the basin in place it is expected that all the surface flood water would be contained within it, but raising plot 3 and it's garden will further ensure the water is contained in the basin area and that there is no flood risk to property.

By reducing the number of dwellings on the site and in the surface water floodzone, in accordance with LLFA advice and introducing flood water storage, it has therefore been possible to ensure that all the proposed properties will remain safe from flooding for their design life, without displacing the flood risk elsewhere.

2.2 SuDS Surface Water Drainage

The approach to Sustainable Urban Drainage Systems (SuDS) is to control water quantity, water quality, amenity and biodiversity by incorporating SuDS features into a drainage design and by producing a management train to achieve enhancements in all areas.

The recommended hierarchy for SuDS drainage is to use infiltration where possible and BRE365 testing carried out on this site does indicate that infiltration will be a suitable solution.

In order to ensure water quality treatment, it is proposed to utilise permeable paving throughout the site for the access road and also private driveways and hardstandings. Clean water from house and garage roof areas will be directed to cellular soakaways located a minimum of 5m off buildings.

Calculations have been undertaken for the proposed drainage strategy to demonstrate that the infiltration design can be achieved and are appended.

3. CONCLUSION AND RECOMMENDATIONS

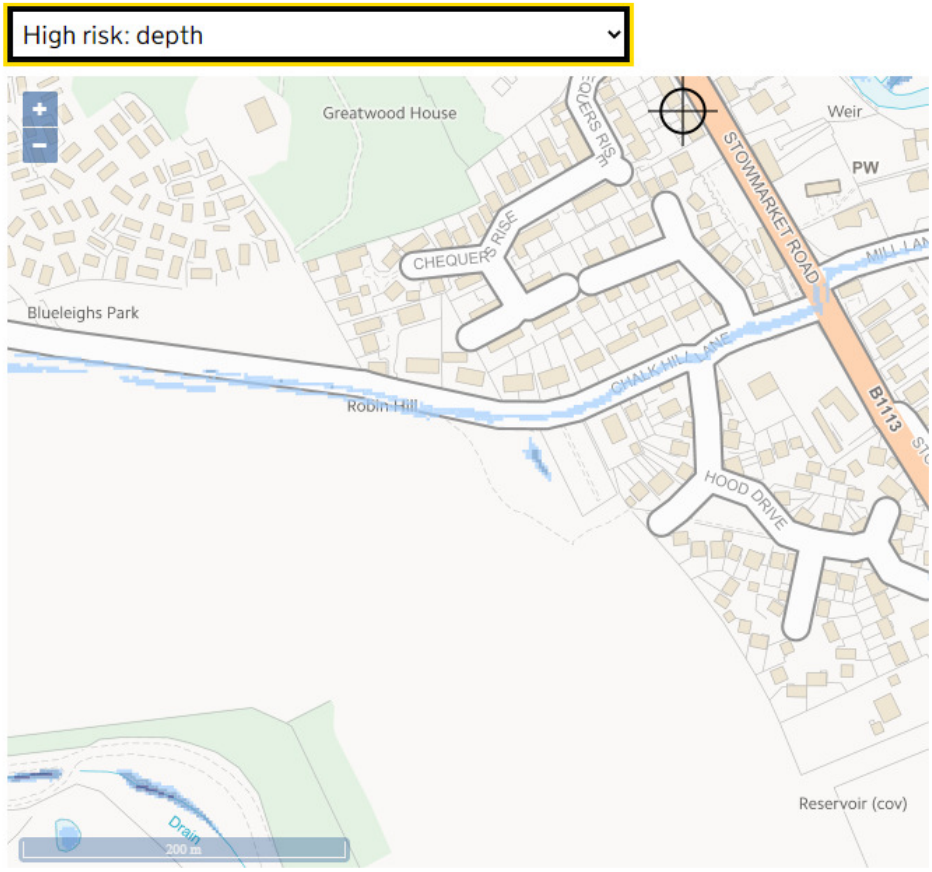
An FRA was produced for the proposed development which highlighted overland surface water flood risk and also discussed surface water drainage by infiltration, but did not provide details of how the flood risk would be mitigated, or test results and drainage design to support an infiltration strategy.

The number of dwellings proposed for the site and layout to accommodate has subsequently been revised and updated to provide mitigation to the flood risk, and to direct the proposed dwellings outside of it. Flood mitigation has been provided in a form that will also provide an opportunity to enhance ecological and amenity value on the site.

In order to provide a detailed drainage strategy for surface water on the site and also as recommended by the FRA, infiltration testing was undertaken on the site in November 2020 and the results as appended have been used to inform a strategic design of permeable pavement and cellular soakaways for the site. Calculations for the outline drainage system are appended.

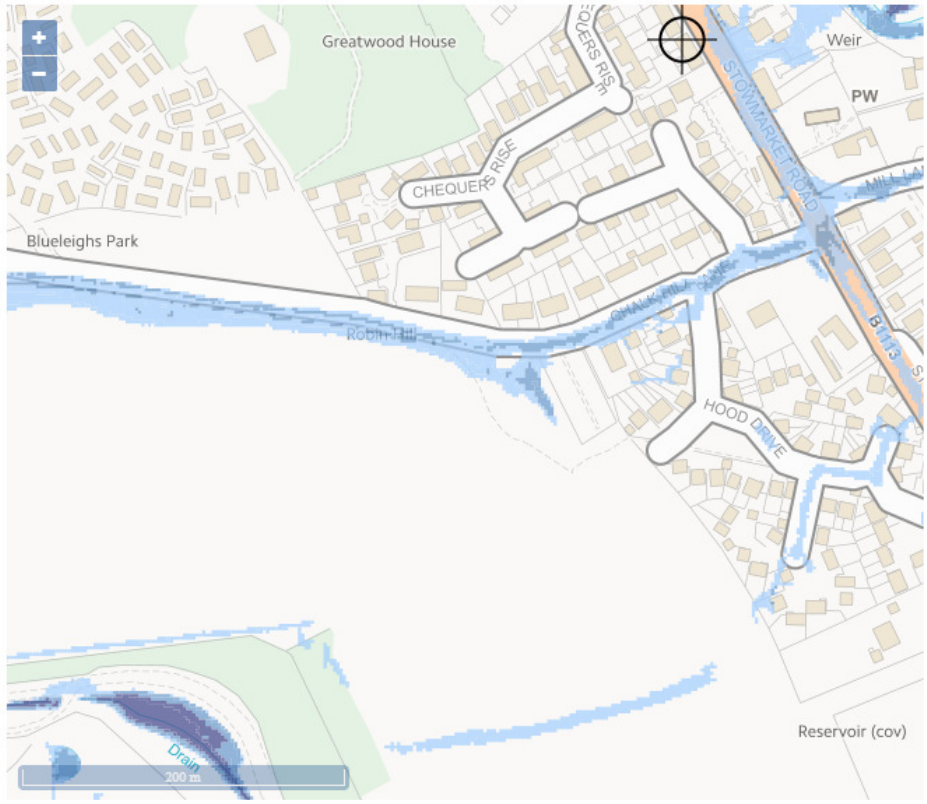
By providing detail of how the surface water flood risk on the site will be safely mitigated and also how the surface water drainage on the site will be managed, it is considered that the basis of the current LLFA Objection has been satisfactorily addressed.

4. APPENDIX A – OVERLAND SURFACE WATER FLOOD RISK

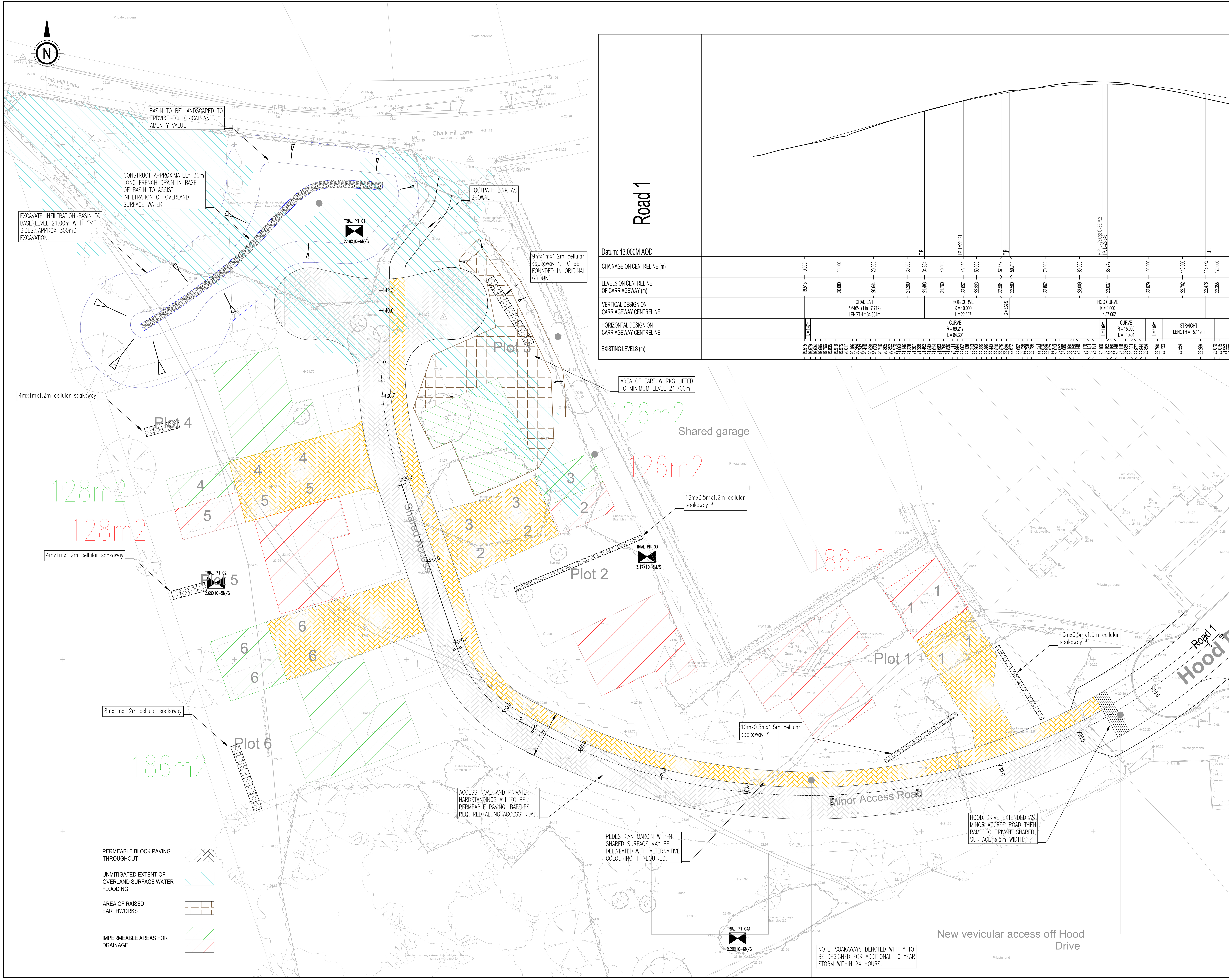


Medium risk: depth

Low risk: depth



5. APPENDIX B – DRAINAGE STRATEGY LAYOUT 2010-493-SK001



Road 1

Datum: 13.000M AOD

CHAINAGE ON CENTRELINE (m)	0.000	10.000	20.000	30.000	34.854	40.000	46.158	50.000	57.462	59.711	70.000	80.000	88.242	100.000	110.000	116.772	120.000	130.000	140.000	142.346
LEVELS ON CENTRELINE OF CARRIAGEWAY (m)	19.515	20.080	20.644	21.209	21.483	21.760	22.057	22.223	22.504	22.580	22.862	23.009	23.037	22.929	22.702	22.476	22.355	21.981	21.606	21.518

VERTICAL DESIGN ON CARRIAGEWAY CENTRELINE: GRADIENT 5.646% (1 in 17.712) LENGTH = 34.854m; HOG CURVE K = 10.000 L = 22.607; G = 3.39%; HOG CURVE K = 8.000 L = 57.062; GRADIENT -3.747% (-1 in 26.685) LENGTH = 25.573m

HORIZONTAL DESIGN ON CARRIAGEWAY CENTRELINE: L = 1.47m; CURVE R = 69.217 L = 84.301; L = 1.89m; CURVE R = 15.000 L = 11.401; L = 4.99m; STRAIGHT LENGTH = 15.119m; CURVE R = 45.000 L = 14.628; STRAIGHT L = 8.342m

EXISTING LEVELS (m): 19.515 19.579 19.634 19.696 19.766 19.835 19.916 19.975 20.017 20.186 20.264 20.342 20.419 20.528 20.623 20.716 20.805 20.892 20.978 21.063 21.146 21.228 21.307 21.386 21.462 21.543 21.614 21.683 21.760 21.836 21.911 21.984 22.062 22.138 22.213 22.263 22.325 22.385 22.443 22.510 22.575 22.639 22.672 22.692 22.726 22.758 22.786 22.821 22.879 22.929 22.972 23.013 23.052 23.086 23.150 23.150 23.148 23.176 23.181 23.191 23.169 23.162 23.160 23.148 23.118 23.089 23.031 22.977 22.944 22.894 22.790 22.733 22.554 22.259 22.078 22.015 21.952 21.886 21.819 21.756 21.648 21.645 21.627 21.612 21.597 21.536 21.508 21.518

Rev	Revision Notes	Dwn	Apvd	Date
A	EDITED TO SUIT ARCHITECT LAYOUT DATED 25.11.2020	JH	RGW	26.11.2020

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PRELIMINARY

Project: CHALK HILL LANE, GREAT BLAKENHAM IPSWICH

Drawing Title: SURFACE WATER MITIGATION AND DRAINAGE STRATEGY

Client: KLH ARCHITECTS

Date: NOV 2020

Drawn: RGW | Designed: RGW | Checked: | Approved: RGW

Scale: 1:250 (5m 0m 5m 10m 15m)

Project No: 2010-493 | Drawing No & Revision: SK001 | Size: A1

6. APPENDIX C – INFILTRATION TESTING AND DESIGN CALCULATIONS

GEOSPHERE ENVIRONMENTAL

Our Ref: 5264,SK,Ltr01,PC,17-11-20,V1

Your Ref: 5264,SK

KLH Architects
The Old Steelyard
Poplar Lane
Sproughton, Ipswich
Suffolk
IP8 3HL

Date: 17 November 2020

For the attention of Mr Ben Moore

By Email:
ben@klharchitects.com

Dear Ben,

INFILTRATION TESTING AT CHALK HILL LANE, GREAT BLAKENHAM, IPSWICH

1. Introduction

This letter report has been prepared for KLH Architects.

The primary objective of this ground investigation was to assess the infiltration potential of the natural soils beneath the site.

This was achieved by:

- Excavating a number of machine-dug trial pits across the site;
- Undertaking soakage testing in line with BRE Digest 365 guidance; and
- Undertaking infiltration calculations to allow for an assessment of the suitability of soakaways or infiltration techniques for the future development of the site.

It is understood that the proposed development will comprise seven residential plots with associated access roads and garden areas. A Proposed Development Plan, provided by the client, Drawing ref. 4772-0102-P03 is provided within Appendix 4 at the end of this letter report.

A Site Location Plan, Drawing ref. 5264,SK/001/Rev0, is presented at the end of this letter report in Appendix 4.

The purpose of this letter report is to provide factual data only.

2. Site Works

2.1 Methodology

This ground investigation was carried out on the basis of the practices set out in BRE Digest 365, 'Soakaway Design'. 2016, which requires, in summary, a total of three infiltration tests to be undertaken in succession over a 24-hour period or tests to be undertaken on consecutive days.

The exploratory holes were positioned at client supplied locations.

In general, where a test location showed limited or no infiltration, it was allowed to continue for circa 24 hours, the data obtained and the test ceased. Where a test exhibited appreciable infiltration and the "75%" infiltration level was achieved, a further infiltration "run", or more was undertaken.

2.2 Scope

Site works were carried out on 02 and 03 November 2020, and comprised the following:

- Excavation of machine excavated trial pits in four locations, (TP01 to TP04), to a maximum depth of 2.0mbgl;
- Undertaking infiltration testing in line with BRE Digest 365 guidance; and
- Undertaking infiltration calculations to allow for an assessment of the suitability of soakaways for the future development of the site.

An Exploratory Hole Location Plan, Drawing ref. 5264,SK/002/Rev0, is presented at the end of this letter report in Appendix 4.

An unidentified obstruction, potentially a service or tank, was encountered within TP04, excavation was halted and the position relocated approximately 2m to the south east as TP04A.

2.3 Ground Conditions Encountered

The sequence of the strata encountered during the investigation generally confirms the anticipated geology as interpreted from geological mapping.

The sequence and indicative thickness of strata are summarised in Table 1 below, with the Exploratory Hole Logs provided in Appendix 2:

Table 1 - Ground Conditions

Strata	Depth Encountered (mbgl)		Strata Thickness (m)	Location and Composition
	From	To		
Topsoil.	0.00	0.30 – 0.40	0.30 – 0.40	All exploratory holes: A brown silty gravelly SAND. Gravel is flint.
Possible fill.	0.30	1.45	Unproven	TP04 only: A brown clayey gravelly SAND
Granular deposits.	0.30 – 0.40	1.05 – 1.80	Unproven	TP01, TP02, TP04A: Orange brown and pale grey mottled gravelly clay with chalk and flint and chalk gravel.
Newhaven Chalk.	0.40 – 1.10	Unproven	Unproven	TP02, TP03, TP04A: Generally light brown to white with variable quantities of sand, gravel and putty

2.4 Groundwater

No groundwater was encountered in any of the exploratory holes during the intrusive investigation.

GEOSPHERE ENVIRONMENTAL

2.5 Infiltration Testing Results

Soil infiltration testing was undertaken in accordance with BRE 365, 2016. The results are summarised in Table 2 below and are provided in full in Appendix 3, presented at the end of this letter report:

Table 2 - Summary of Soil Infiltration Results

Location	Test 1 (m/s)	Test 2 (m/s)	Test 3 (m/s)	Notes
TP01	4.13x10-06	2.19x10-06	4.67x10-06	None
TP02	3.53x10-05	3.32x10-05	2.69x10-05	None
TP03	1.18x10-05	1.26x10-05	3.17x10-06	None
TP04A	2.20x10-06	2.22x10-06	3.19x10-06	None

We trust the above is clear and acceptable. If you have any questions, please do not hesitate to contact us.

Yours sincerely

Peter Coyne
Technical Assistant
Geosphere Environmental Ltd
peter@geosphere-environmental.co.uk

Enclosures:
Appendix 1 – Report Limitations and Conditions
Appendix 2 – Exploratory Hole Logs
Appendix 3 – Infiltration Testing Results
Appendix 4 – Drawings

GEOSPHERE ENVIRONMENTAL

APPENDICES

GEOSPHERE ENVIRONMENTAL

APPENDIX 1 – REPORT LIMITATIONS AND CONDITIONS

This report refers, within the limitations stated, to the condition of the site at the time of the inspections. No warranty is given as to the possibility of future changes in the condition of the site.

This report has been prepared for the sole use of the Client for the purposes described and no extended duty of care to any third party is implied or offered. Third parties using any information contained within this report do so at their own risk.

This report is prepared and written for the use stated herein; it should not be used for any other purposes without reference to Geosphere Environmental Limited. The report has been prepared in relation to the proposed end-use, should another end-use be intended, a further re-assessment may be required. It is likely that over time practises will improve and the relevant guidance and legislation be amended or superseded, which may necessitate a re-assessment of the site.

The accuracy of any map extracts cannot be guaranteed. It is possible that different conditions existed onsite, between and subsequent to the various map surveys appended.

Whilst the report may express an opinion on possible configurations of strata between or beyond exploratory holes discussed or on the possible presence of features based on visual, verbal or published evidence, this is for guidance only and no liability can be accepted for its accuracy.

GEOSPHERE ENVIRONMENTAL

APPENDIX 2 – EXPLORATORY HOLE LOGS

Trial Pit Logs
(TP01 to TP04A)

Geosphere Environmental Ltd
Unit 11 Brightwell Barns
Brightwell, Ipswich, IP10 0BJ
Telephone: 01603 298 076

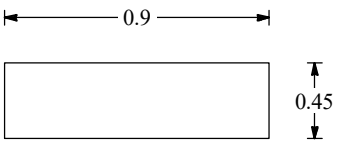
TRIAL PIT LOG

Project	Client	TRIAL PIT No
Chalk Hill Lane, Great Blakenham	KLH Architects	**TP01**

Job No	Date	Ground Level (m)	Grid Reference ()
5264,SK	02-11-20		

Fieldwork By	Logged By	Sheet
GEL	PC	1 of 1

Depth	DESCRIPTION	Legend	Depth	No	Remarks/Tests
0.00-0.40	Brown silty gravelly fine and medium ORGANIC SAND with active fine and medium roots. Gravel is subanuglar to subrounded fine to coarse flint (TOPSOIL)				Trial pit remained dry and stable upon completion
0.40-1.80	Light brown slightly gravelly slightly clayey fine and medium SAND. Gravel is fine to coarse subangular and subrounded flint and chalk 1.10 Becoming gravelly				
	Becoming denser				Trial pit completed at 1.9m



Shoring/Support: Gravel backfill
Stability: Stable

All dimensions in metres Scale 1:20.8333333333333	Method Trial Pit/trench	Plant Used MECHANICAL EXCAVATOR	Checked By SG

Geosphere Environmental Ltd
Unit 11 Brightwell Barns
Brightwell, Ipswich, IP10 0BJ
Telephone: 01603 298 076

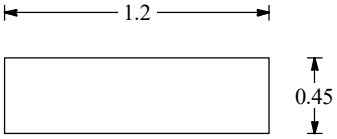
TRIAL PIT LOG

Project	Client	TRIAL PIT No
Chalk Hill Lane, Great Blakenham	KLH Architects	**TP02**

Job No	Date	Ground Level (m)	Grid Reference ()
5264,SK	02-11-20		

Fieldwork By	Logged By	Sheet
GEL	PC	1 of 1

Depth	DESCRIPTION	Legend	Depth	No	Remarks/Tests
0.00-0.35	Brown silty slightly gravelly fine and medium ORGANIC SAND. Gravel is fine and medium flint with fine active roots (TOPSOIL)				Trial pit remained dry and stable upon completion
0.35-1.05	Orangish brown gravelly fine and medium SAND. Gravel is fine to coarse angular to subrounded flint and chalk				
1.05-2.00	Unstructured CHALK recovered as an orangish brown/white sandy gravel of fine to coarse subangular and subrounded chalk				
					Trial pit completed at 2.0m



Shoring/Support: Gravel backfill
Stability: Stable

All dimensions in metres Scale 1:20.8333333333333	Method Trial Pit/trench	Plant Used MECHANICAL EXCAVATOR	Checked By SG

Geosphere Environmental Ltd
Unit 11 Brightwell Barns
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Telephone: 01603 298 076

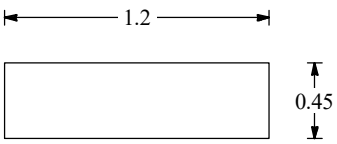
TRIAL PIT LOG

Project	Client	TRIAL PIT No
Chalk Hill Lane, Great Blakenham	KLH Architects	**TP03**

Job No	Date	Ground Level (m)	Grid Reference ()
5264,SK	02-11-20		

Fieldwork By	Logged By	Sheet
GEL	PC	1 of 1

Depth	DESCRIPTION	Legend	Depth	No	Remarks/Tests
0.00-0.40	Brown silty slightly gravelly fine and medium SAND with fine and medium active roots. Gravel is fine and medium subangular to rounded flint (TOPSOIL)				Trial pit remained dry and stable upon completion
0.40-2.00	Unstructured CHALK recovered as a light brown/off-white sandy gravelly putty. Gravel is fine to coarse angular to subrounded chalk 0.80 Recovered as a slightly putty sandy GRAVEL 1.20 With gravel of angular to subrounded fine to coarse flint 1.60 Becoming white				Trial pit completed at 2.0m



Shoring/Support: Gravel backfill
Stability: Stable

All dimensions in metres Scale 1:20.8333333333333	Method Trial Pit/trench	Plant Used MECHANICAL EXCAVATOR	Checked By SG

Geosphere Environmental Ltd
Unit 11 Brightwell Barns
Brightwell, Ipswich, IP10 0BJ
Telephone: 01603 298 076

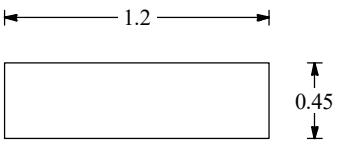
TRIAL PIT LOG

Project	Client	TRIAL PIT No
Chalk Hill Lane, Great Blakenham	KLH Architects	**TP04**

Job No	Date	Ground Level (m)	Grid Reference ()
5264,SK	02-11-20		

Fieldwork By	Logged By	Sheet
GEL	PC	1 of 1

Depth	DESCRIPTION	Legend	Depth	No	Remarks/Tests
0.00-0.30	Brown slightly silty slightly gravelly fine and medium SAND. Gravel is fine to coarse flint with active fine and medium roots (TOPSOIL)				
0.30-1.45	Brown clayey gravelly fine and medium SAND. Gravel is fine and medium subangular to rounded flint and chalk 0.90 Gravel becoming fine to coarse				
	Unidentified obstruction				Trial pit terminated at 1.45mbgl due to unidentified obstruction - suspected pipe or tank. Hole repositioned as TP04A



Shoring/Support: Gravel backfill
Stability: Stable

All dimensions in metres Scale 1:20.8333333333333	Method Trial Pit/trench	Plant Used MECHANICAL EXCAVATOR	Checked By SG

Geosphere Environmental Ltd
Unit 11 Brightwell Barns
Brightwell, Ipswich, IP10 0BJ
Telephone: 01603 298 076

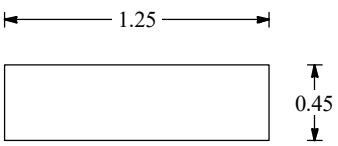
TRIAL PIT LOG

Project	Client	TRIAL PIT No
Chalk Hill Lane, Great Blakenham	KLH Architects	**TP04A**

Job No	Date	Ground Level (m)	Grid Reference ()
5264,SK	02-11-20		

Fieldwork By	Logged By	Sheet
GEL	PC	1 of 1

Depth	DESCRIPTION	Legend	Depth	No	Remarks/Tests
0.00-0.30	Brown slightly silty slightly gravelly fine and medium SAND. Gravel is fine to coarse flint with active fine and medium roots (TOPSOIL)				Trial pit remained dry and stable upon completion
0.30-1.10	Light brown gravelly fine and medium SAND. Gravel is angular to subrounded fine to coarse chalk				
1.10-2.00	Structured CHALK recovered as a slightly putty gravelly fine to coarse SAND. Gravel is fine to coarse angular to subrounded chalk and flint				Trial pit completed at 2.0m



Shoring/Support: Gravel backfill
Stability: Stable

All dimensions in metres Scale 1:20.8333333333333	Method Trial Pit/trench	Plant Used MECHANICAL EXCAVATOR	Checked By SG

APPENDIX 3 – INFILTRATION TEST RESULTS

TRIAL PIT INFILTRATION TEST - BRE DIGEST 365

Project Number: 5264,SK

Date: 16/11/2020

Project Name: Chalk Hill Lane, Great Blakenham

Time [min]	Depth to Water [mbgl]
0	0.78
1	0.89
2	0.97
3	1.00
4	1.03
5	1.03
10	1.08
21	1.16
44	1.26
84	1.36
108	1.41
185	1.54

Pit Size [m]		
Length	**Width**	**Depth**
0.90	0.45	1.70

Infiltration Rate Calculations		
Parameter	**Unit**	**Result**
height		
h_{75}	[m]	1.470
h_{25}	[m]	1.010
h_{75}-h_{25}	[m]	0.460
time		
t_{75}	[s]	8400.00
t_{25}	[s]	192.00
t_{75} - t_{25}	[s]	8208.00
effective volume		
v_{75-25}	[m^3]	0.056
effective area		
ap_{50}	[m^2]	1.647
soil infiltration rate		
f	[m/s]	4.13E-06

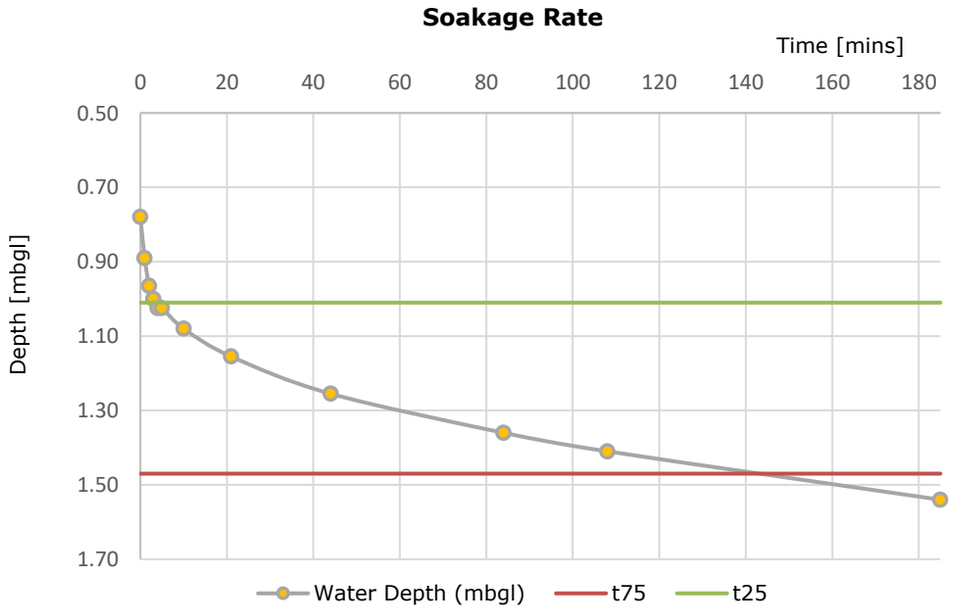
Trial Pit TP01

Run 1 of 3

Test Date 02/11/2020

Groundwater Encountered: N/A

Remarks: Gravel backfilled for stability



Calculated by: PC

Checked by: SG

TRIAL PIT INFILTRATION TEST - BRE DIGEST 365

Project Number: 5264,SK

Project Name: Chalk Hill Lane, Great Blakenham

Date: 16/11/2020

Time [min]	Depth to Water [mbgl]
0	0.98
1	0.99
2	1.01
3	1.03
12	1.10
22	1.13
42	1.18
57	1.20
117	1.29
177	1.35
237	1.46
297	1.55
357	1.57
417	1.64

Pit Size [m]		
Length	**Width**	**Depth**
0.90	0.45	1.70

Infiltration Rate Calculations		
Parameter	**Unit**	**Result**
height		
h_{75}	[m]	1.520
h_{25}	[m]	1.160
h_{75}-h_{25}	[m]	0.360
time		
t_{75}	[s]	16800.00
t_{25}	[s]	2280.00
t_{75} - t_{25}	[s]	14520.00
effective volume		
v_{75-25}	[m^3]	0.044
effective area		
ap_{50}	[m^2]	1.377
soil infiltration rate		
f	[m/s]	2.19E-06

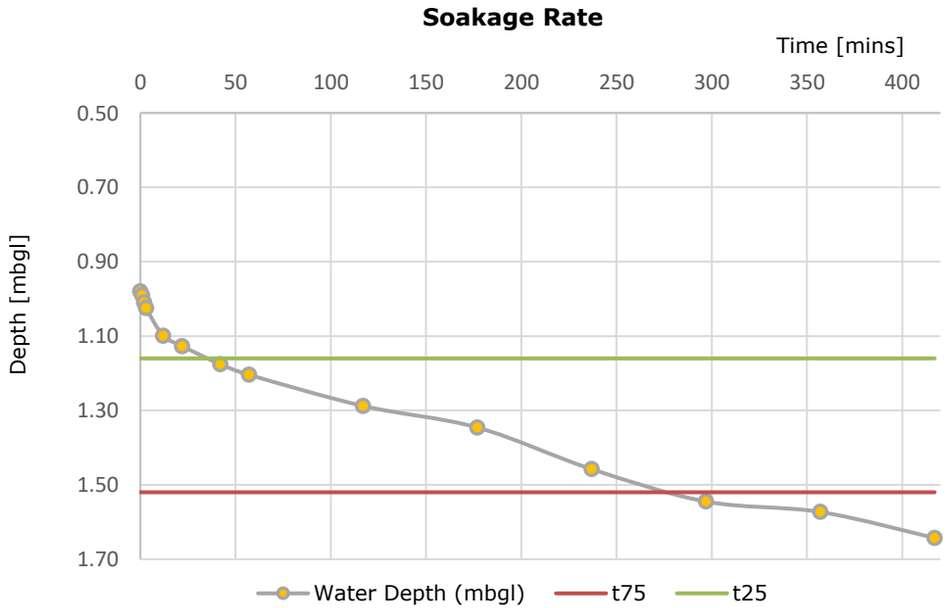
Trial Pit TP01

Run 2 of 3

Test Date 02/11/2020

Groundwater Encountered: N/A

Remarks: Gravel backfilled for stability



Calculated by: PC

Checked by: SG

TRIAL PIT INFILTRATION TEST - BRE DIGEST 365

Project Number: 5264,SK

Date: 16/11/2020

Project Name: Chalk Hill Lane, Great Blakenham

Time [min]	Depth to Water [mbgl]
0	0.75
1	0.86
2	0.96
3	0.99
4	1.02
20	1.16
45	1.26
60	1.30
120	1.45
180	1.56
240	1.63

Pit Size [m]		
Length	**Width**	**Depth**
0.90	0.45	1.70

Infiltration Rate Calculations		
Parameter	**Unit**	**Result**
height		
h_{75}	[m]	1.463
h_{25}	[m]	0.988
h_{75}-h_{25}	[m]	0.475
time		
t_{75}	[s]	7500.00
t_{25}	[s]	180.00
t_{75} - t_{25}	[s]	7320.00
effective volume		
v_{75-25}	[m^3]	0.058
effective area		
ap_{50}	[m^2]	1.688
soil infiltration rate		
f	[m/s]	4.67E-06

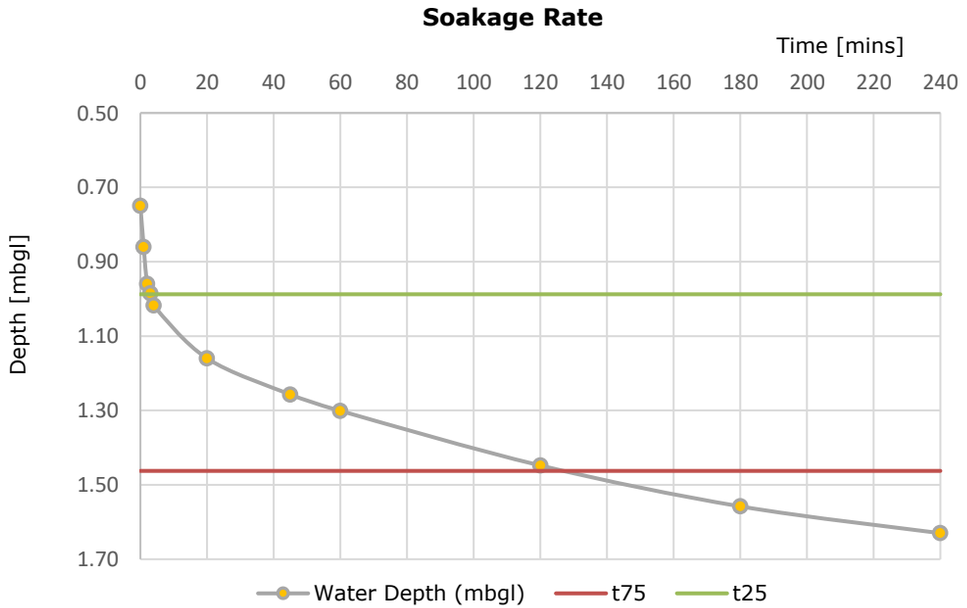
Trial Pit TP01

Run 3 of 3

Test Date 03/11/2020

Groundwater Encountered: N/A

Remarks: Gravel backfilled for stability



Calculated by: PC

Checked by: SG

TRIAL PIT INFILTRATION TEST - BRE DIGEST 365

Project Number: 5264,SK

Project Name: Chalk Hill Lane, Great Blakenham

Date: 16/11/2020

Time [min]	Depth to Water [mbgl]
0	1.24
1	1.38
2	1.44
3	1.50
4	1.53
5	1.57
10	1.70
15	1.78
20	1.83

Pit Size [m]		
Length	**Width**	**Depth**
1.20	0.45	2.00

Infiltration Rate Calculations		
Parameter	**Unit**	**Result**
height		
h_{75}	[m]	1.810
h_{25}	[m]	1.430
h_{75}-h_{25}	[m]	0.380
time		
t_{75}	[s]	1080.00
t_{25}	[s]	108.00
t_{75} - t_{25}	[s]	972.00
effective volume		
v_{75-25}	[m^3]	0.062
effective area		
ap_{50}	[m^2]	1.794
soil infiltration rate		
f	[m/s]	3.53E-05

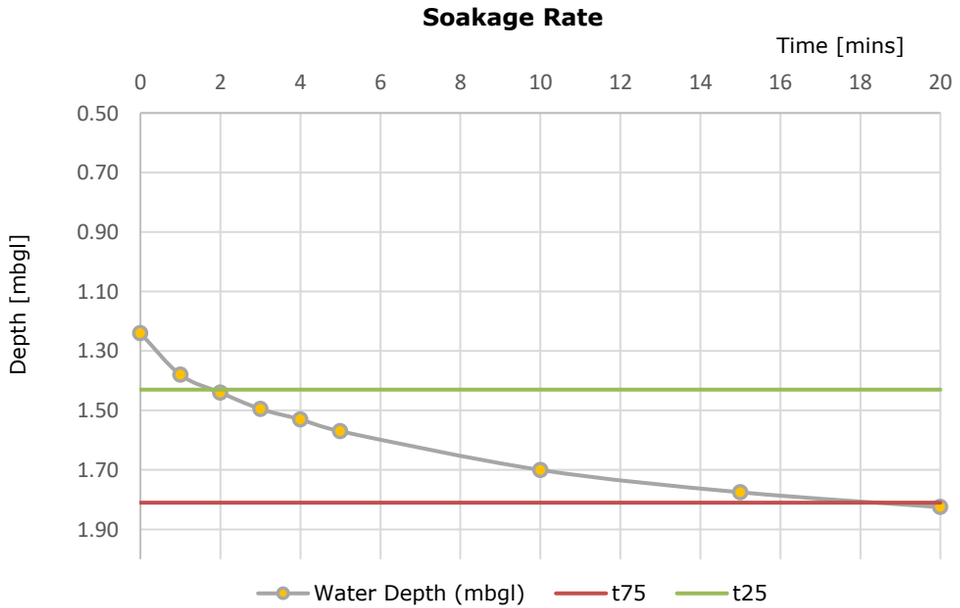
Trial Pit TP02

Run 1 of 3

Test Date 02/11/2020

Groundwater Encountered: N/A

Remarks: Gravel backfilled for stability



Calculated by: PC

Checked by: SG

TRIAL PIT INFILTRATION TEST - BRE DIGEST 365

Project Number: 5264,SK

Date: 16/11/2020

Project Name: Chalk Hill Lane, Great Blakenham

Time [min]	Depth to Water [mbgl]
0	1.20
1	1.31
2	1.38
3	1.43
4	1.48
5	1.52
10	1.65
18	1.78
33	1.90

Pit Size [m]		
Length	**Width**	**Depth**
1.20	0.45	2.00

Infiltration Rate Calculations		
Parameter	**Unit**	**Result**
height		
h_{75}	[m]	1.800
h_{25}	[m]	1.400
h_{75}-h_{25}	[m]	0.400
time		
t_{75}	[s]	1200.00
t_{25}	[s]	150.00
t_{75} - t_{25}	[s]	1050.00
effective volume		
v_{75-25}	[m^3]	0.065
effective area		
ap_{50}	[m^2]	1.860
soil infiltration rate		
f	[m/s]	3.32E-05

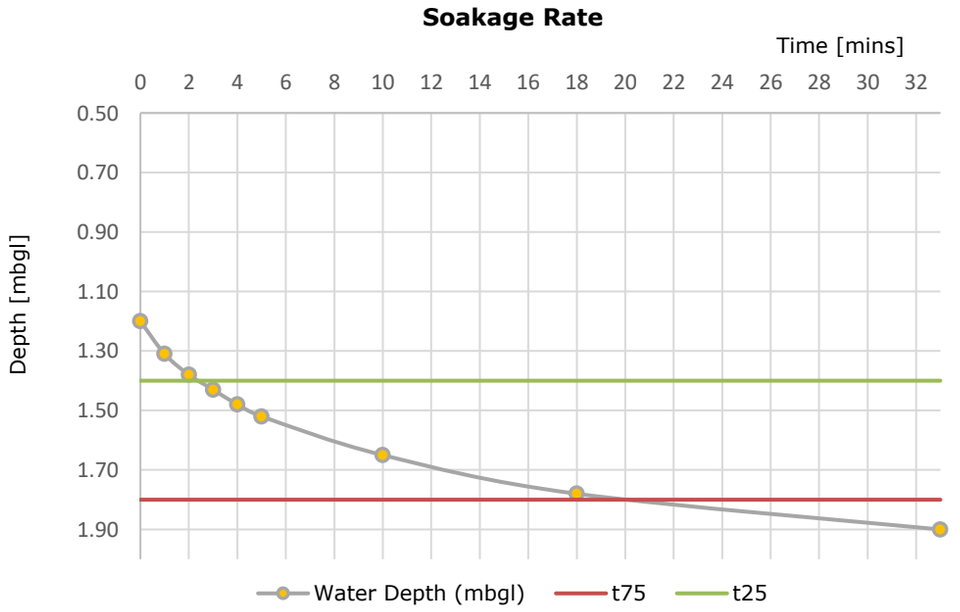
Trial Pit TP02

Run 2 of 3

Test Date 02/11/2020

Groundwater Encountered: N/A

Remarks: Gravel backfilled for stability



Calculated by: PC

Checked by: SG

TRIAL PIT INFILTRATION TEST - BRE DIGEST 365

Project Number: 5264,SK

Project Name: Chalk Hill Lane, Great Blakenham

Date: 16/11/2020

Time [min]	Depth to Water [mbgl]
0	1.27
1	1.32
2	1.35
3	1.40
4	1.45
5	1.49
10	1.62
16	1.73
25	1.82
30	1.86

Pit Size [m]		
Length	**Width**	**Depth**
1.20	0.45	2.00

Infiltration Rate Calculations		
Parameter	**Unit**	**Result**
height		
h_{75}	[m]	1.818
h_{25}	[m]	1.453
h_{75}-h_{25}	[m]	0.365
time		
t_{75}	[s]	1500.00
t_{25}	[s]	240.00
t_{75} - t_{25}	[s]	1260.00
effective volume		
v_{75-25}	[m^3]	0.059
effective area		
ap_{50}	[m^2]	1.745
soil infiltration rate		
f	[m/s]	2.69E-05

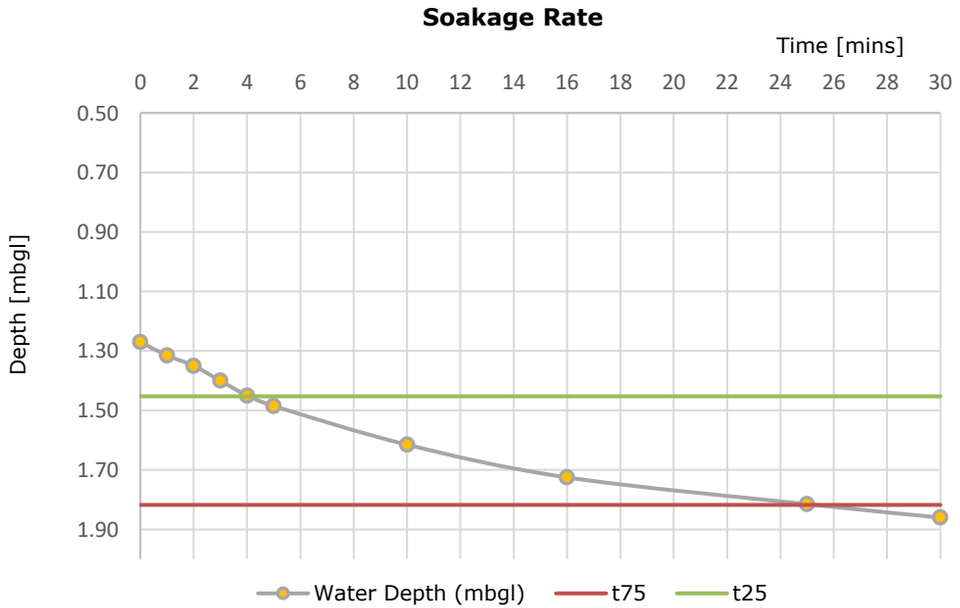
Trial Pit TP02

Run 3 of 3

Test Date 02/11/2020

Groundwater Encountered: N/A

Remarks: Gravel backfilled for stability



Calculated by: PC

Checked by: SG

TRIAL PIT INFILTRATION TEST - BRE DIGEST 365

Project Number: 5264,SK

Date: 16/11/2020

Project Name: Chalk Hill Lane, Great Blakenham

Time [min]	Depth to Water [mbgl]
0	1.31
1	1.34
2	1.37
3	1.39
4	1.41
5	1.43
10	1.52
19	1.62
37	1.73
58	1.85

Pit Size [m]		
Length	**Width**	**Depth**
1.20	0.45	2.00

Infiltration Rate Calculations		
Parameter	**Unit**	**Result**
height		
h_{75}	[m]	1.828
h_{25}	[m]	1.483
h_{75}-h_{25}	[m]	0.345
time		
t_{75}	[s]	3300.00
t_{25}	[s]	480.00
t_{75} - t_{25}	[s]	2820.00
effective volume		
v_{75-25}	[m^3]	0.056
effective area		
ap_{50}	[m^2]	1.679
soil infiltration rate		
f	[m/s]	1.18E-05

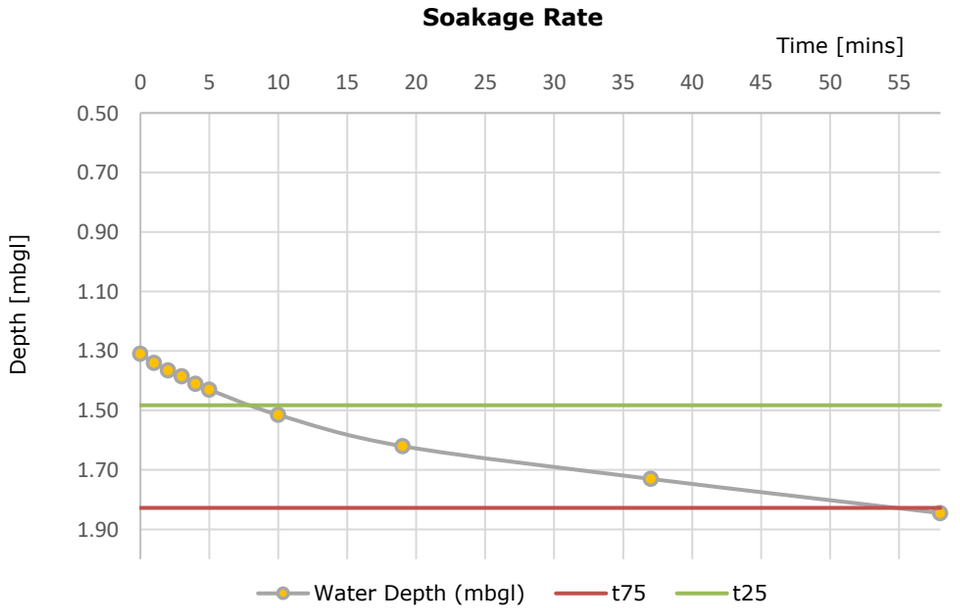
Trial Pit TP03

Run 1 of 3

Test Date 02/11/2020

Groundwater Encountered: N/A

Remarks: Gravel backfilled for stability



Calculated by: PC

Checked by: SG

TRIAL PIT INFILTRATION TEST - BRE DIGEST 365

Project Number: 5264,SK

Project Name: Chalk Hill Lane, Great Blakenham

Date: 16/11/2020

Time [min]	Depth to Water [mbgl]
0	1.36
5	1.40
15	1.57
25	1.69
45	1.82
60	1.85
75	1.87
90	1.91

Pit Size [m]		
Length	**Width**	**Depth**
1.20	0.45	2.00

Infiltration Rate Calculations		
Parameter	**Unit**	**Result**
height		
h_{75}	[m]	1.839
h_{25}	[m]	1.516
h_{75}-h_{25}	[m]	0.323
time		
t_{75}	[s]	3300.00
t_{25}	[s]	720.00
t_{75} - t_{25}	[s]	2580.00
effective volume		
v_{75-25}	[m^3]	0.052
effective area		
ap_{50}	[m^2]	1.604
soil infiltration rate		
f	[m/s]	1.26E-05

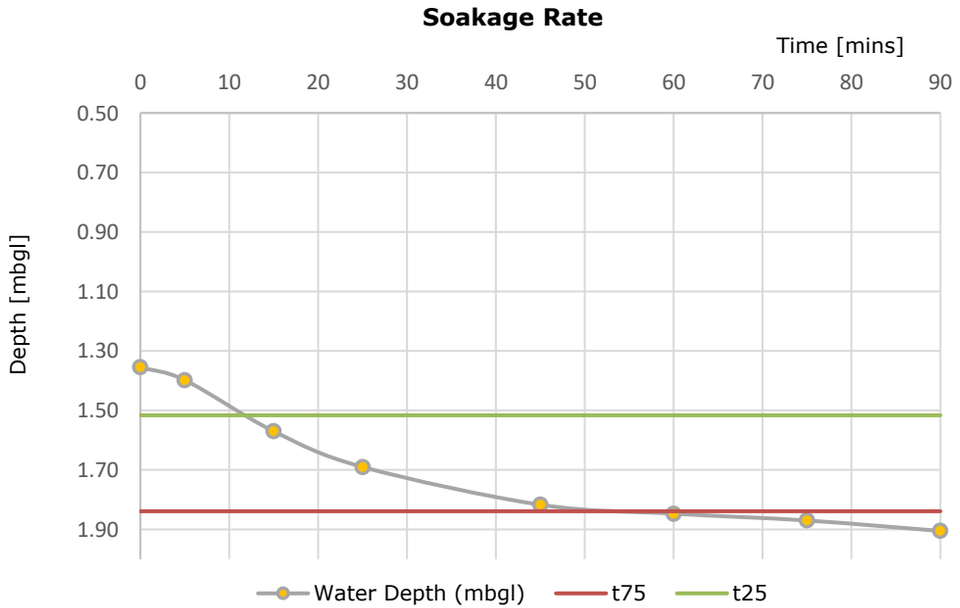
Trial Pit TP03

Run 2 of 3

Test Date 02/11/2020

Groundwater Encountered: N/A

Remarks: Gravel backfilled for stability



Calculated by: PC

Checked by: SG

TRIAL PIT INFILTRATION TEST - BRE DIGEST 365

Project Number: 5264,SK

Date: 16/11/2020

Project Name: Chalk Hill Lane, Great Blakenham

Time [min]	Depth to Water [mbgl]
0	1.36
1	1.38
2	1.40
3	1.44
33	1.65
63	1.70
123	1.77
183	1.84
243	1.91
303	1.93

Pit Size [m]		
Length	**Width**	**Depth**
1.20	0.45	2.00

Infiltration Rate Calculations		
Parameter	**Unit**	**Result**
height		
h_{75}	[m]	1.840
h_{25}	[m]	1.520
h_{75}-h_{25}	[m]	0.320
time		
t_{75}	[s]	10980.00
t_{25}	[s]	720.00
t_{75} - t_{25}	[s]	10260.00
effective volume		
v_{75-25}	[m^3]	0.052
effective area		
ap_{50}	[m^2]	1.596
soil infiltration rate		
f	[m/s]	3.17E-06

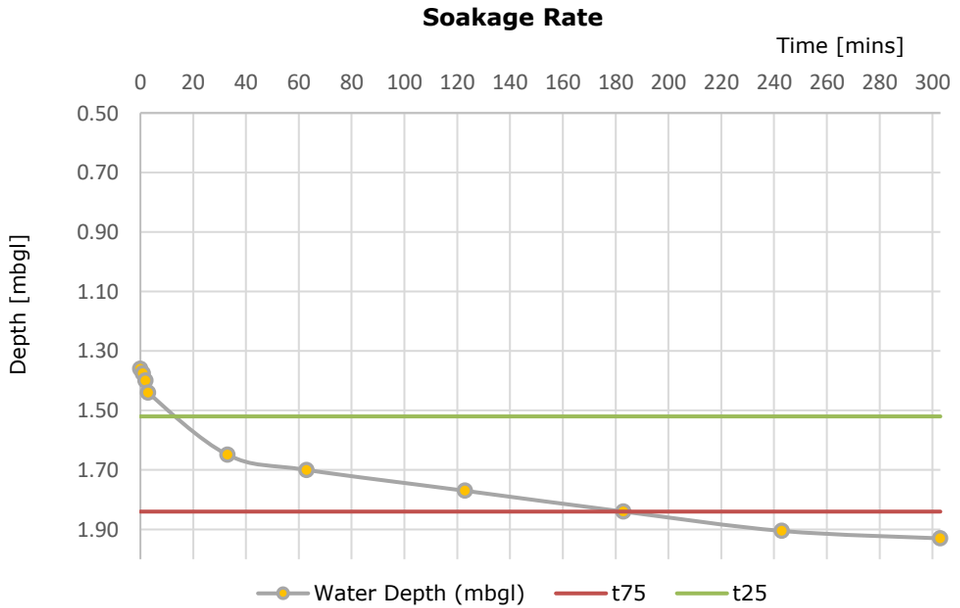
Trial Pit TP03

Run 3 of 3

Test Date 03/11/2020

Groundwater Encountered: N/A

Remarks: Gravel backfilled for stability



Calculated by: PC

Checked by: SG

TRIAL PIT INFILTRATION TEST - BRE DIGEST 365

Project Number: 5264,SK

Project Name: Chalk Hill Lane, Great Blakenham

Date: 16/11/2020

Time [min]	Depth to Water [mbgl]
0	1.29
1	1.36
2	1.37
3	1.39
4	1.42
5	1.43
10	1.48
17	1.52
38	1.60
53	1.64
185	1.76
240	1.80
300	1.840

Pit Size [m]		
Length	**Width**	**Depth**
1.25	0.45	2.00

Infiltration Rate Calculations		
Parameter	**Unit**	**Result**
height		
h_{75}	[m]	1.823
h_{25}	[m]	1.468
h_{75}-h_{25}	[m]	0.355
time		
t_{75}	[s]	15900.00
t_{25}	[s]	480.00
t_{75} - t_{25}	[s]	15420.00
effective volume		
v_{75-25}	[m^3]	0.060
effective area		
ap_{50}	[m^2]	1.770
soil infiltration rate		
f	[m/s]	2.20E-06

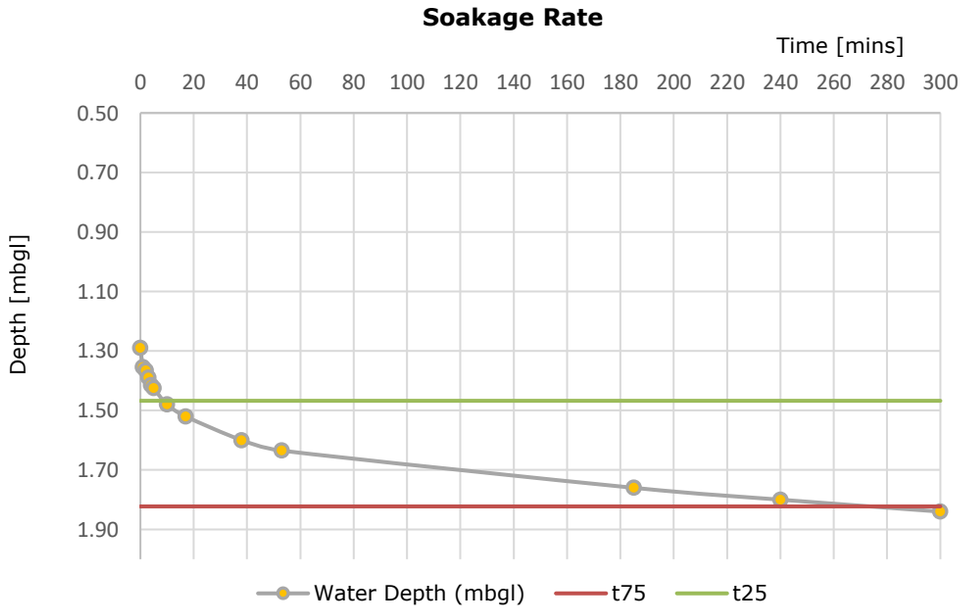
Trial Pit TP04

Run 1 of 3

Test Date 02/11/2020

Groundwater Encountered: N/A

Remarks: Gravel backfilled for stability



Calculated by: PC

Checked by: SG

TRIAL PIT INFILTRATION TEST - BRE DIGEST 365

Project Number: 5264,SK

Project Name: Chalk Hill Lane, Great Blakenham

Date: 16/11/2020

Time [min]	Depth to Water [mbgl]
0	1.29
1	1.31
2	1.33
3	1.35
4	1.37
5	1.39
9	1.42
29	1.55
59	1.59
119	1.68
179	1.75
239	1.80
299	1.84
359	1.87

Pit Size [m]		
Length	**Width**	**Depth**
1.25	0.45	2.00

Infiltration Rate Calculations		
Parameter	**Unit**	**Result**
height		
h_{75}	[m]	1.821
h_{25}	[m]	1.464
h_{75}-h_{25}	[m]	0.358
time		
t_{75}	[s]	16200.00
t_{25}	[s]	900.00
t_{75} - t_{25}	[s]	15300.00
effective volume		
v_{75-25}	[m^3]	0.060
effective area		
ap_{50}	[m^2]	1.778
soil infiltration rate		
f	[m/s]	2.22E-06

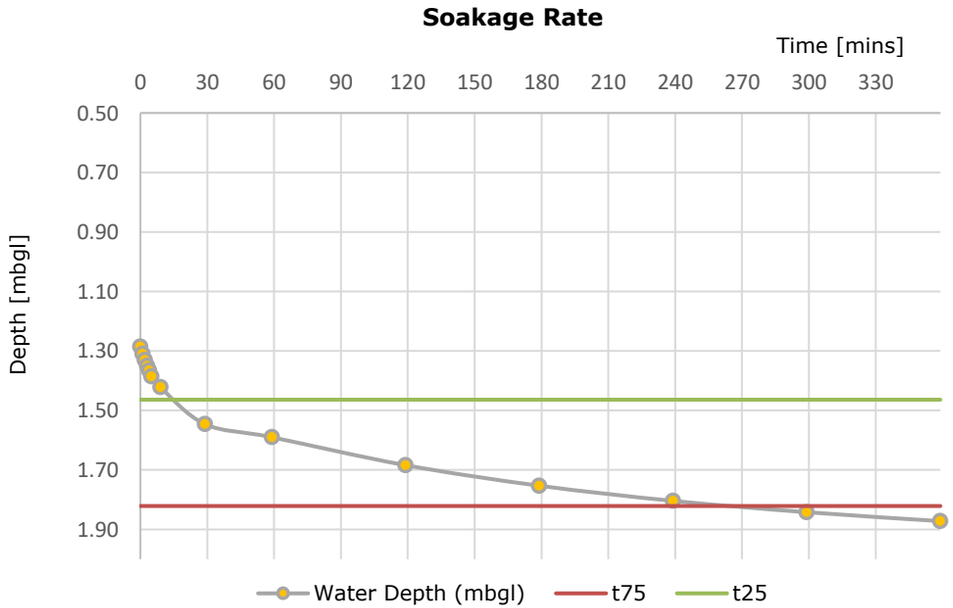
Trial Pit TP04

Run 2 of 3

Test Date 02/11/2020

Groundwater Encountered: N/A

Remarks: Gravel backfilled for stability



Calculated by: PC

Checked by: SG

TRIAL PIT INFILTRATION TEST - BRE DIGEST 365

Project Number: 5264,SK

Date: 16/11/2020

Project Name: Chalk Hill Lane, Great Blakenham

Time [min]	Depth to Water [mbgl]
0	1.36
1	1.38
2	1.40
3	1.44
33	1.65
63	1.70
123	1.77
183	1.84
243	1.91
303	1.93

Pit Size [m]		
Length	**Width**	**Depth**
1.25	0.45	2.00

Infiltration Rate Calculations		
Parameter	**Unit**	**Result**
height		
h_{75}	[m]	1.840
h_{25}	[m]	1.520
h_{75}-h_{25}	[m]	0.320
time		
t_{75}	[s]	10980.00
t_{25}	[s]	720.00
t_{75} - t_{25}	[s]	10260.00
effective volume		
v_{75-25}	[m^3]	0.054
effective area		
ap_{50}	[m^2]	1.651
soil infiltration rate		
f	[m/s]	3.19E-06

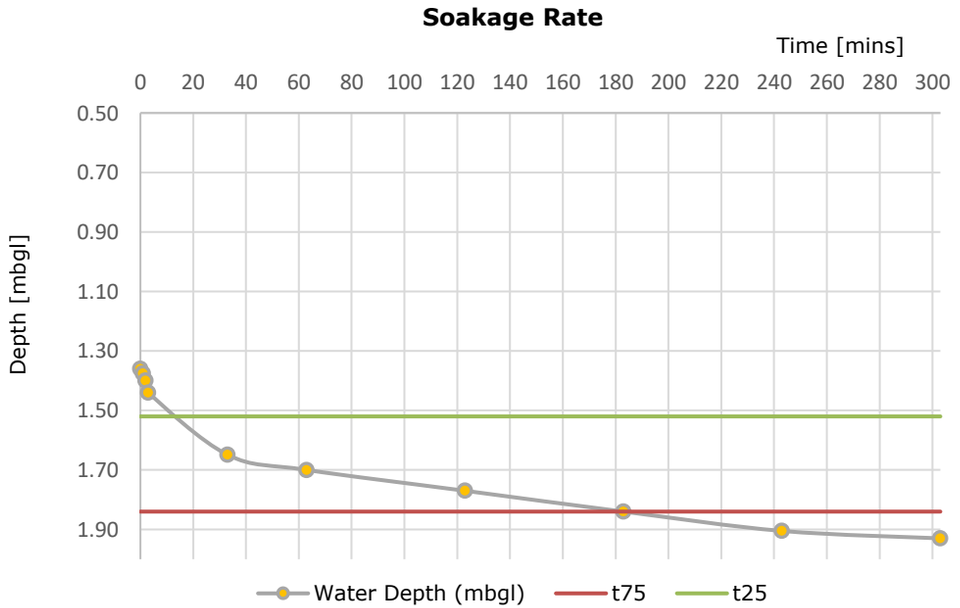
Trial Pit TP04

Run 3 of 3

Test Date 03/11/2020

Groundwater Encountered: N/A

Remarks: Gravel backfilled for stability



Calculated by: PC

Checked by: SG

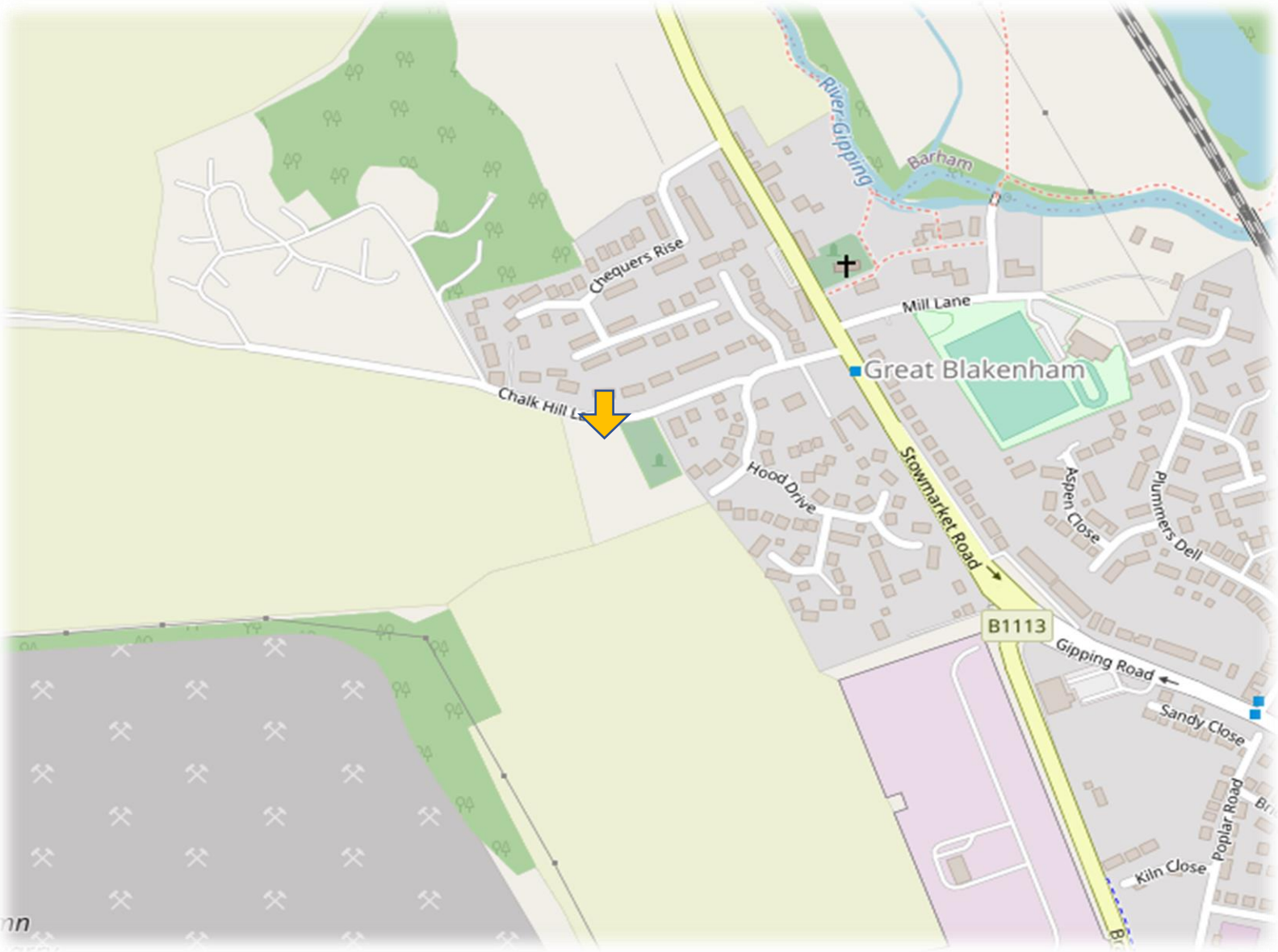
GEOSPHERE ENVIRONMENTAL

APPENDIX 4 – DRAWINGS

Site Location Plan - Drawing ref. 5264,SK/001/Rev0

Exploratory Hole Location Plan – Drawing ref. 5264,SK/002/Rev0

Proposed Development Plan – KLH Architects, Drawing ref. 4772-0102-P03



GEOSPHERE ENVIRONMENTAL

LEGEND

Site Location

SOURCE

© OpenStreetMap contributors

PROJECT

Chalk Hill Lane, Great Blakenham

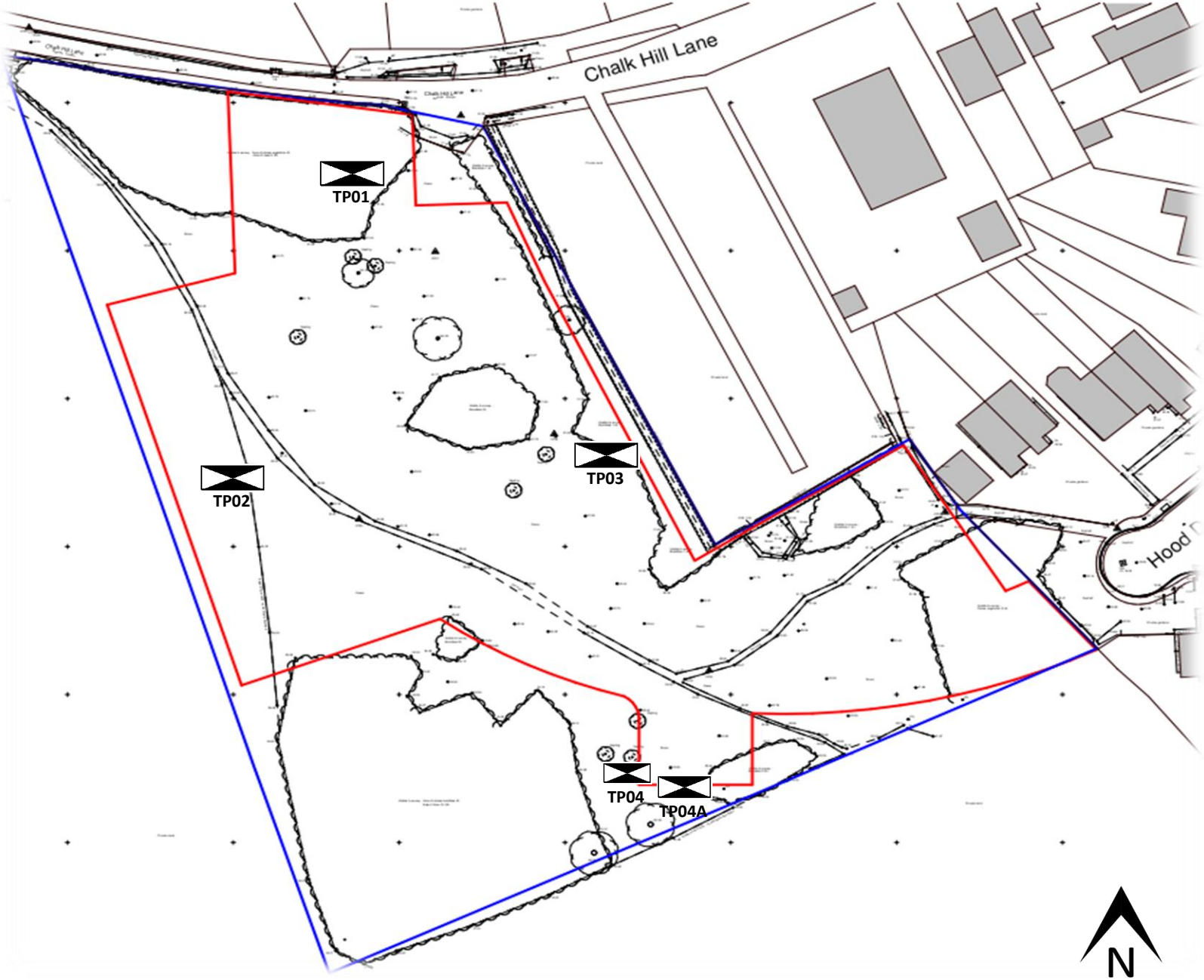
TITLE

Site Location Plan

DRAWING NUMBER

5264,SK/001/Rev0

SCALE	DATE
NTS	16/11/2020
DRAWN BY	**CHECKED BY**
PC	SG



GEOSPHERE ENVIRONMENTAL

LEGEND

Site boundary

Trial Pit

SOURCE

Client Provided

PROJECT

Chalk Hill Lane, Great Blakenham

TITLE

Exploratory Hole Location Plan

DRAWING NUMBER

5264,SK/002/Rev0

SCALE	DATE
NTS	16/11/2020
DRAWN BY	**CHECKED BY**
PC	SG

NO DIMENSIONS TO BE SCALED FROM THIS DRAWING

This document references the following file:-

Reference Name	Status	Revision
PC-XX-XX-M3-Designer-0001_4772		P01.1

Revisions		Date	Drawn / Chk'd
P01	First Issue	04/12/19	BM
P02	First Issue	17/03/20	WD/BM
P03	Notes added	14/05/20	BM

HOUSING SCHEDULE

House Type	Quantity	No. of Beds	GIA	No. of Spaces
1	3	3BB	145m²	2
2	4	2BB	110m²	2
Total:	7			

Garage Type	
Single	4
Double	3
Total:	7

	Proposed Trees
	Existing Trees
	Adoptable
	Shared

GARDEN SIZES

PLOT	House Type	Garden Size
1	HT1	90m²
2	HT2	160m²
3	HT2	140m²
4	HT1	200m²
5	HT2	170m²
6	HT2	115m²
7	HT1	105m²

Block Plan as Proposed
1 : 500

Client
Mr R. Hood

Project
Proposed Residential Development, land at Chalk Hill Lane, Great Blakenham

Title
Block Plan as Proposed

Project Nº	Drawing Nº	Revision
4772	-0102	P03

Scale - unless otherwise stated: As indicated @ A2

Issued For: COMMENT

BS 1192 Ref.: PC-Designer-0102

Status

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Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
SA5	0.014	4.00	22.700	450	1.400
DUM5	0.000		22.700	450	1.500
SA7	0.020	4.00	25.000	450	0.700
DUM7	0.000		25.000	450	0.800
SA3	0.013	4.00	21.500	450	0.600
DUM3	0.000		21.500	450	0.700
SA1	0.019	4.00	21.600	450	0.700
DUM1	0.000		21.600	450	0.800
PP	0.005	4.00	22.000	450	0.615
DUMPP	0.000		22.000	450	0.700
SA2	0.013	4.00	21.800	450	0.800
DUM2	0.000		21.800	450	0.900

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
5.000	SA5	DUM5	2.000	0.600	21.300	21.200	0.100	20.0	100	4.02	50.0
7.000	SA7	DUM7	2.000	0.600	24.300	24.200	0.100	20.0	100	4.02	50.0
3.000	SA3	DUM3	2.000	0.600	20.900	20.800	0.100	20.0	100	4.02	50.0
1.000	SA1	DUM1	2.000	0.600	20.900	20.800	0.100	20.0	100	4.02	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
5.000	1.734	13.6	1.9	1.300	1.400	0.014	0.0	25	1.225
7.000	1.734	13.6	2.7	0.600	0.700	0.020	0.0	30	1.348
3.000	1.734	13.6	1.8	0.500	0.600	0.013	0.0	25	1.203
1.000	1.734	13.6	2.6	0.600	0.700	0.019	0.0	29	1.329

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
10.00	PP	DUMPP	2.000	0.600	21.385	21.300	0.085	23.5	150	4.02	50.0
2.000	SA2	DUM2	2.000	0.600	21.000	20.900	0.100	20.0	100	4.02	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
10.00	2.084	36.8	0.7	0.465	0.550	0.005	0.0	14	0.809
2.000	1.734	13.6	1.8	0.700	0.800	0.013	0.0	25	1.203

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	2880
Ratio-R	0.400	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	40	0	0

Node DUM5 Online Pump Control

Flap Valve	x	Invert Level (m)	21.200	Switch off depth (m)	0.400
Replaces Downstream Link	✓	Switch on depth (m)	0.500		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.001	0.000	1.000	0.000	2.000	0.000

Node DUM7 Online Pump Control

Flap Valve	x	Invert Level (m)	24.200	Switch off depth (m)	1.900
Replaces Downstream Link	✓	Switch on depth (m)	2.000		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.001	0.000	1.000	0.000	2.000	0.000

Node DUM1 Online Pump Control

Flap Valve	x	Invert Level (m)	20.800	Switch off depth (m)	0.400
Replaces Downstream Link	✓	Switch on depth (m)	0.500		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.001	0.000	1.000	0.000	2.000	0.000

Node DUM3 Online Pump Control

Flap Valve	x	Invert Level (m)	20.800	Switch off depth (m)	0.400
Replaces Downstream Link	✓	Switch on depth (m)	0.500		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.001	0.000	1.000	0.000	2.000	0.000

Node DUMPP Online Pump Control

Flap Valve	x	Invert Level (m)	21.300	Switch off depth (m)	0.400
Replaces Downstream Link	✓	Switch on depth (m)	0.500		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.001	0.000	1.000	0.000	2.000	0.000

Node DUM2 Online Pump Control

Flap Valve	x	Invert Level (m)	20.900	Switch off depth (m)	1.800
Replaces Downstream Link	✓	Switch on depth (m)	2.000		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.001	0.000	1.000	0.000	2.000	0.000

Node SA5 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.09680	Safety Factor	2.0	Invert Level (m)	20.400
Side Inf Coefficient (m/hr)	0.09680	Porosity	1.00	Time to half empty (mins)	500

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	4.0	4.0	0.600	4.0	10.0	1.200	4.0	16.0	1.201	0.0	16.0

Node SA7 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.09680	Safety Factor	2.0	Invert Level (m)	23.100
Side Inf Coefficient (m/hr)	0.09680	Porosity	1.00	Time to half empty (mins)	304

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	8.0	8.0	0.600	8.0	18.8	1.200	8.0	29.6	1.201	0.0	29.6

Node SA3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.01140	Safety Factor	2.0	Invert Level (m)	19.700
Side Inf Coefficient (m/hr)	0.01140	Porosity	1.00	Time to half empty (mins)	2610

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	9.0	9.0	0.600	9.0	21.0	1.200	9.0	29.6	1.201	0.0	33.0

Node SA1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.01140	Safety Factor	2.0	Invert Level (m)	19.600
Side Inf Coefficient (m/hr)	0.01140	Porosity	1.00	Time to half empty (mins)	1545

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	10.0	10.0	0.600	10.0	34.6	1.500	10.0	71.5	1.501	0.0	71.5

Node SA2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.01140	Safety Factor	2.0	Invert Level (m)	19.700
Side Inf Coefficient (m/hr)	0.01140	Porosity	1.00	Time to half empty (mins)	2040

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	8.0	8.0	0.600	8.0	27.8	1.200	8.0	39.6	1.201	0.0	39.6

Node PP Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.01140	Invert Level (m)	21.385	Slope (1:X)	25.0
Side Inf Coefficient (m/hr)	0.01140	Time to half empty (mins)	456	Depth (m)	0.325
Safety Factor	3.0	Width (m)	5.500	Inf Depth (m)	
Porosity	0.30	Length (m)	10.000		

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year +40% CC 15 minute summer	488.233	138.153	100 year +40% CC 360 minute summer	56.677	14.585
100 year +40% CC 15 minute winter	342.620	138.153	100 year +40% CC 360 minute winter	36.841	14.585
100 year +40% CC 30 minute summer	320.551	90.705	100 year +40% CC 480 minute summer	43.979	11.622
100 year +40% CC 30 minute winter	224.948	90.705	100 year +40% CC 480 minute winter	29.219	11.622
100 year +40% CC 60 minute summer	214.603	56.713	100 year +40% CC 600 minute summer	35.604	9.738
100 year +40% CC 60 minute winter	142.577	56.713	100 year +40% CC 600 minute winter	24.327	9.738
100 year +40% CC 120 minute summer	129.587	34.246	100 year +40% CC 720 minute summer	31.433	8.424
100 year +40% CC 120 minute winter	86.094	34.246	100 year +40% CC 720 minute winter	21.125	8.424
100 year +40% CC 180 minute summer	97.729	25.149	100 year +40% CC 960 minute summer	25.432	6.697
100 year +40% CC 180 minute winter	63.526	25.149	100 year +40% CC 960 minute winter	16.847	6.697
100 year +40% CC 240 minute summer	75.977	20.078	100 year +40% CC 1440 minute summer	18.055	4.839
100 year +40% CC 240 minute winter	50.477	20.078	100 year +40% CC 1440 minute winter	12.134	4.839

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 98.45%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	SA5	176	22.620	1.320	2.4	5.2760	0.0000	FLOOD RISK
180 minute winter	DUM5	176	22.620	1.420	3.6	0.2257	0.0000	OK
180 minute winter	SA7	172	24.434	0.134	3.0	9.7022	0.0000	SURCHARGED
180 minute winter	DUM7	172	24.434	0.234	3.6	0.0372	0.0000	OK
1440 minute winter	SA3	1380	21.064	0.164	1.7	10.9021	0.0000	SURCHARGED
1440 minute winter	DUM3	1380	21.064	0.264	3.7	0.0420	0.0000	OK
720 minute winter	SA1	690	20.962	0.062	1.5	13.6595	0.0000	OK
720 minute winter	DUM1	690	20.962	0.162	3.6	0.0257	0.0000	OK
480 minute winter	PP	456	21.773	0.388	0.3	2.6733	0.0000	FLOOD RISK
480 minute winter	DUMPP	456	21.773	0.473	0.1	0.0753	0.0000	OK
1440 minute winter	SA2	1380	21.238	0.237	1.7	9.7192	0.0000	SURCHARGED
1440 minute winter	DUM2	1380	21.238	0.337	3.7	0.0537	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute winter	SA5	5.000	DUM5	3.6	0.589	0.263	0.0156	
180 minute winter	SA5	Infiltration		0.2				
180 minute winter	DUM5	Pump		0.0				0.0
180 minute winter	SA7	7.000	DUM7	3.6	0.589	0.263	0.0156	
180 minute winter	SA7	Infiltration		0.4				
180 minute winter	DUM7	Pump		0.0				0.0
1440 minute winter	SA3	3.000	DUM3	3.7	0.600	0.269	0.0156	
1440 minute winter	SA3	Infiltration		0.1				
1440 minute winter	DUM3	Pump		0.0				0.0
720 minute winter	SA1	1.000	DUM1	3.6	0.586	0.262	0.0129	
720 minute winter	SA1	Infiltration		0.1				
720 minute winter	DUM1	Pump		0.0				0.0
480 minute winter	PP	10.00	DUMPP	0.1	0.156	0.003	0.0352	
480 minute winter	PP	Infiltration		0.1				
480 minute winter	DUMPP	Pump		0.0				0.0
1440 minute winter	SA2	2.000	DUM2	3.7	0.600	0.269	0.0156	
1440 minute winter	SA2	Infiltration		0.1				
1440 minute winter	DUM2	Pump		0.0				0.0