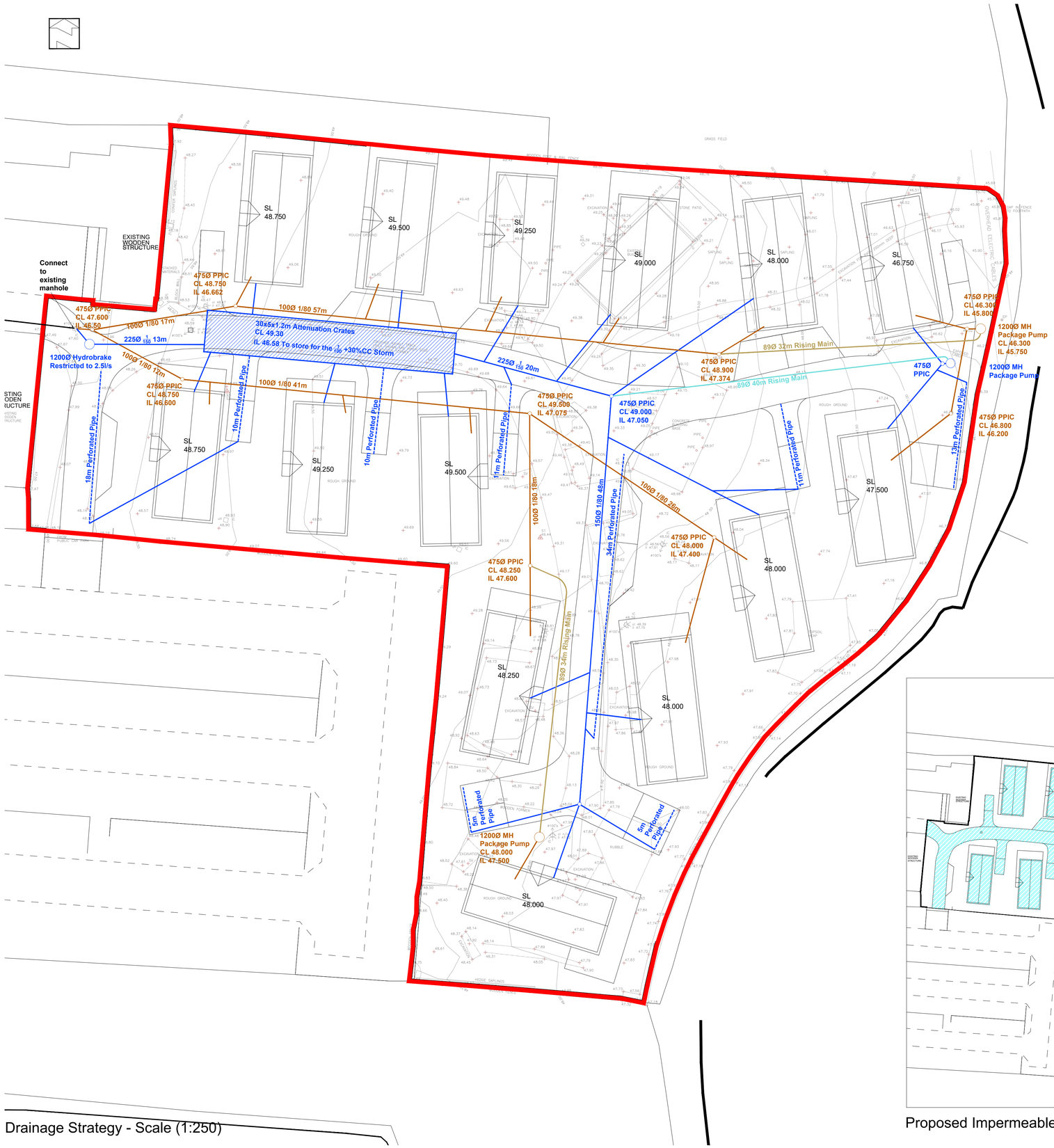

Drainage Strategy - Scale (1:250)

Key

- Proposed Surface Water Drainage
- Proposed Foul Water Drainage
- Existing Private Combined

Notes:

1. This drawing is to be read in conjunction with all relevant architect's and engineer's drawings.

2. It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement.

Drainage Strategy

The site is located within flood zone 1 with a low risk of flooding from rivers or the sea and is less than 1 hectare, therefore a site specific flood risk assessment should not be required.

The site is currently Greenfield

Under SuDs guidance the first point of discharge for surface water is percolation via soakaway. Site percolation testing was carried out 6th October 2021, and is proven that soakaways via infiltration is not viable. Please refer to Topping Engineers percolation report.

The second point of discharge is via watercourse but there are none within the vicinity of site

NPPF guidelines require that surface water arising from a developed site should as far as practicable be managed in a sustainable manner to mimic the surface water flows arising from the site prior to development.

Surface Water:

The existing site is a grassed field and overflow car park

The proposed impermeable area is 3000m^2.

We are proposing to discharge to the combined sewer onsite at a discharge rate of 2.5l/s this is the minimum flow rate to prevent blockages of the hydro brake manhole.

Based on a discharge rate of 2.5l/s restricted by HydroBrake MD-SHE-0072-2500-1400-2500 and an impermeable area of 3000m² the attenuation required for the peak return period of 1 in 100 year plus 30% climate change is **180m3.**

This will be achieved by Storage Crates measuring

30 x 5 x 1.2m = 180m³

Foul Water:

The foul water is proposed to connect unrestricted to the existing sewer on site

Proposed Impermeable Area Plan = 3000m² - Scale (1:150)

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18/10/2021

No.	Revision	Date	Drwn
Status	Preliminary		

TOPPING ENGINEERS
CONSULTING CIVIL & STRUCTURAL ENGINEERS
Windsor House Cornwall Road Harrogate HG1 2PW
t: 01423 522 293
w: www.topping-engineers.com
e: info@topping-engineers.com

Client: J.HUDSON

Project: COOK BAY STAITHES

Drawing title: Drainage Strategy

Drawn	Chkd	Date	Scale
RT	AD	12.10.21	As Shown @ A1

Contract No.	Drg No.	Revision
21619	DR-C-0100	P1

21619 – Cooks Bay, Staithes

Surface Water Drainage Maintenance and Management Schedule:

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Attenuation Tank/Basin

Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Inspect and identify areas that are not operating correctly. If required take remedial action	Monthly for the first 3 months of operation then annually
	Recover debris from catchment surface area where it may cause risk to performance	Monthly
	Remove sediment and debris from pre-tank system	Annually
Remedial Actions	Repair inlets/outlets/vents/overflows	As necessary
Monitoring	Inspect all inlets/outlets and upstream drainage system to ensure they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment and build up and remove if necessary	Every 5 years

Hydrobrake Manhole

Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Remove sediment and debris from flow control chambers and upstream manholes	Monthly for first 12 months then 6 monthly
Remedial Actions	Replace or clean hydrobrake if performance deteriorates or failure occurs	As necessary
Monitoring	Check flow control to ensure emptying is occurring	Quarterly and post high intensity storm event

Aire House
12 Victoria Avenue
Harrogate, HG1 1ED

Date 15/10/2021 16:57 | Designed by Rob
File SOURCE CRATES STAITHES.... | Checked by
Innovyze | Source Control 2020.1

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 623 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	46.870	0.420	0.0	2.3	2.3	59.9	O K
30 min Summer	47.017	0.567	0.0	2.3	2.3	80.8	O K
60 min Summer	47.175	0.725	0.0	2.3	2.3	103.3	O K
120 min Summer	47.324	0.874	0.0	2.3	2.3	124.6	O K
180 min Summer	47.396	0.946	0.0	2.3	2.3	134.8	O K
240 min Summer	47.433	0.983	0.0	2.3	2.3	140.1	O K
360 min Summer	47.464	1.014	0.0	2.3	2.3	144.4	O K
480 min Summer	47.466	1.016	0.0	2.3	2.3	144.8	O K
600 min Summer	47.459	1.009	0.0	2.3	2.3	143.8	O K
720 min Summer	47.449	0.999	0.0	2.3	2.3	142.4	O K
960 min Summer	47.425	0.975	0.0	2.3	2.3	139.0	O K
1440 min Summer	47.371	0.921	0.0	2.3	2.3	131.2	O K
2160 min Summer	47.286	0.836	0.0	2.3	2.3	119.1	O K
2880 min Summer	47.201	0.751	0.0	2.3	2.3	107.0	O K
4320 min Summer	47.004	0.554	0.0	2.3	2.3	79.0	O K
5760 min Summer	46.849	0.399	0.0	2.3	2.3	56.9	O K
7200 min Summer	46.743	0.293	0.0	2.3	2.3	41.7	O K
8640 min Summer	46.671	0.221	0.0	2.3	2.3	31.4	O K
10080 min Summer	46.622	0.172	0.0	2.2	2.2	24.5	O K
15 min Winter	46.923	0.473	0.0	2.3	2.3	67.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	110.870	0.0	61.7	26
30 min Summer	75.267	0.0	83.9	40
60 min Summer	48.838	0.0	109.6	70
120 min Summer	30.611	0.0	137.4	128
180 min Summer	22.939	0.0	154.4	186
240 min Summer	18.551	0.0	166.5	244
360 min Summer	13.705	0.0	184.6	362
480 min Summer	11.052	0.0	198.4	472
600 min Summer	9.345	0.0	209.7	522
720 min Summer	8.143	0.0	219.2	586
960 min Summer	6.546	0.0	234.9	714
1440 min Summer	4.802	0.0	258.3	988
2160 min Summer	3.515	0.0	284.5	1408
2880 min Summer	2.813	0.0	303.5	1824
4320 min Summer	2.050	0.0	331.7	2596
5760 min Summer	1.636	0.0	353.3	3280
7200 min Summer	1.374	0.0	370.8	3960
8640 min Summer	1.192	0.0	386.0	4592
10080 min Summer	1.057	0.0	399.1	5256
15 min Winter	110.870	0.0	69.1	26

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	47.089	0.639	0.0	2.3	2.3	91.1	O K
60 min Winter	47.266	0.816	0.0	2.3	2.3	116.3	O K
120 min Winter	47.438	0.988	0.0	2.3	2.3	140.8	O K
180 min Winter	47.524	1.074	0.0	2.4	2.4	153.0	O K
240 min Winter	47.570	1.120	0.0	2.4	2.4	159.6	O K
360 min Winter	47.614	1.164	0.0	2.5	2.5	165.8	O K
480 min Winter	47.626	1.176	0.0	2.5	2.5	167.6	O K
600 min Winter	47.621	1.171	0.0	2.5	2.5	166.8	O K
720 min Winter	47.605	1.155	0.0	2.5	2.5	164.6	O K
960 min Winter	47.575	1.125	0.0	2.4	2.4	160.3	O K
1440 min Winter	47.498	1.048	0.0	2.3	2.3	149.4	O K
2160 min Winter	47.370	0.920	0.0	2.3	2.3	131.2	O K
2880 min Winter	47.240	0.790	0.0	2.3	2.3	112.6	O K
4320 min Winter	46.935	0.485	0.0	2.3	2.3	69.0	O K
5760 min Winter	46.735	0.285	0.0	2.3	2.3	40.6	O K
7200 min Winter	46.628	0.178	0.0	2.2	2.2	25.4	O K
8640 min Winter	46.573	0.123	0.0	2.0	2.0	17.5	O K
10080 min Winter	46.545	0.095	0.0	1.9	1.9	13.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	75.267	0.0	94.0	40
60 min Winter	48.838	0.0	122.7	68
120 min Winter	30.611	0.0	153.9	126
180 min Winter	22.939	0.0	173.0	182
240 min Winter	18.551	0.0	186.5	240
360 min Winter	13.705	0.0	206.7	354
480 min Winter	11.052	0.0	222.2	464
600 min Winter	9.345	0.0	234.9	570
720 min Winter	8.143	0.0	245.5	664
960 min Winter	6.546	0.0	263.1	752
1440 min Winter	4.802	0.0	289.1	1064
2160 min Winter	3.515	0.0	318.6	1520
2880 min Winter	2.813	0.0	340.0	1968
4320 min Winter	2.050	0.0	371.6	2724
5760 min Winter	1.636	0.0	395.7	3344
7200 min Winter	1.374	0.0	415.3	3968
8640 min Winter	1.192	0.0	432.3	4584
10080 min Winter	1.057	0.0	447.1	5144

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.600	Shortest Storm (mins)	15
Ratio R	0.331	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.300

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.100	4	8	0.100	8	12	0.100

Model Details

Storage is Online Cover Level (m) 49.000

Cellular Storage Structure

Invert Level (m) 46.450 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	150.0	150.0	1.300	0.0	234.0
1.200	150.0	234.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0072-2500-1200-2500
Design Head (m)	1.200
Design Flow (l/s)	2.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	72
Invert Level (m)	46.450
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.5
Flush-Flo™	0.318	2.3
Kick-Flo®	0.644	1.9
Mean Flow over Head Range	-	2.1

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.9	1.200	2.5	3.000	3.8	7.000	5.7
0.200	2.2	1.400	2.7	3.500	4.1	7.500	5.9
0.300	2.3	1.600	2.8	4.000	4.4	8.000	6.0
0.400	2.3	1.800	3.0	4.500	4.6	8.500	6.2
0.500	2.2	2.000	3.2	5.000	4.8	9.000	6.4
0.600	2.0	2.200	3.3	5.500	5.1	9.500	6.5
0.800	2.1	2.400	3.4	6.000	5.3		
1.000	2.3	2.600	3.6	6.500	5.5		

TOPPING ENGINEERS

CONSULTING CIVIL & STRUCTURAL ENGINEERS

PERCOLATION TESTING REPORT

LOCATION:

Cooks Bay, Staithes

CLIENT: J.HUDSON

DOCUMENT REF:
21619-PTR-001

REVISION/DATE:
Revision A

Aire House 12 Victoria Avenue Harrogate HG1 1ED
t: 01423 522 293 w: www.topping-engineers.com e: info@topping-engineers.com

NYMNPA

18/10/2021

CONTENTS & AMENDMENT HISTORY

Revision	Description	Date	Author	Checked
A	First Issue	October	R Thacker	A Dyson

1.0 TESTING REPORT

The Percolation Testing was carried out on site on 6th October 2021 to establish if infiltration methods were going to be a suitable solution for draining the site.

2 Trial Holes were formed with the following dimensions.

Test Pit 1	1900mm x 600mm x 1300mm deep
Test Pit 2	1900mm x 600mm x 1200mm deep

The water level drop was monitored and recorded (see test sheets attached).

For Test 1 (Test Pit 1), water was filled to a depth of 600mm, after one and a half hours of testing the water level dropped 10mm.

For Test 1 (Test Pit 2), water was filled to a depth of 550mm, after one and a half hours hour of testing the water level dropped 20mm.

Test sheet 1 shows that the infiltration rates are not high enough and do not satisfy BRE 365 requirements. Therefore, Infiltration methods of drainage will not be viable for this site and strategy.

2.0 APPENDICES

Appendix A – Percolation Test Sheet

Appendix A

Percolation Test Sheet

METHOD (from BRE Digest 365)

- Excavate a soakage trail pit to the required depth (typically 1.0m - 2.0m deep) using minimum width (0.3m) and length (1.0m). Carefully trim sides and bottom.
- Carefully measure size of pit and note sizes below.
- Fill soakage hole briskly with water (from bowser) to at least three quarters full. Being careful not to wash away the sides. (Note: a 0.3m wide, 1m long, 1.5m deep trench needs at least 350 litres (80 gallons) of water)
- Place straight edge over top of soakage pit and measure (dip) to the top of the water.
- Record time versus dips in table below. Dip every 5 minutes for the first hour and every hour until pit is one quarter full. Repeat test 3 times in total on the same or consecutive days.

DETAILS

Site Location	**Cooks Bay, Staithes**
Date of Test	**15.10.21**
Weather Conditions	**Autumn - Windy**
Engineer Name	**Rob Thacker**

SIZE OF PIT – Test Pit 1 Length	**Width**	**Depth**
1.9m	0.6m	1.3m

RESULTS

Time (mins)	**Dip (mm)**
0	600
5	600
10	595
15	595
20	595
25	595
30	595
35	595
40	595
45	590
50	590
55	590
60	590
75	590
90	590

SIZE OF PIT – Test Pit 2

Length	Width	Depth
1.9m	0.6m	1.2m

RESULTS

Time (mins)	Dip (mm)
0	550
5	545
10	545
15	545
20	540
25	540
30	540
35	540
40	535
45	535
50	530
55	530
60	530
75	530
90	530

3.0 APPENDICES

Appendix B – Percolation Test Pictures

4.0 APPENDICES

Appendix C – Test Location