



BRIGHT PLAN CIVILS

Surface Water Drainage Design Summary and Calculations

Project name:	Land off Burndell Road, Yapton
Project number:	D1906
Client:	Driftstone Developments Ltd
Prepared by and date:	Dan Lytton; 4 th January 2022
Site address:	Land off Burndell Road, Yapton, West Sussex BN18 0GB
Local Authority:	Arun District Council
Lead Local Flood Authority:	West Sussex County Council
Site area:	13,443m ² (1.34Ha)
Geology:	WS1 – Soft to firm CLAY up to 2.00m below ground level, becoming very silty/fine sandy with gravel of flint and chalk (below 2.30m bgl). Band of very fine sandy SILT (4.40m to 4.60m bgl). RIVER TERRACE DEPOSITS. WS2 – CLAY up to 2.00m bgl (RTD), SAND to 2.80m bgl (RTD), SILT of CHALK from 2.80m bgl to 5.00m bgl (LEWES NODULAR CHALK FORMATION). WS3 – Soft to firm CLAY up to 2.00m (RTD), SAND to 3.80m bgl (RTD) and sandy, gravelly CLAY to 4.00m bgl (RTD). WS4 – Silty, sandy CLAY to 2.00m bgl (RTD), very silty very clayey SAND to 2.50m bgl (RTD), GRAVEL to 3.10m bgl (RTD), SILT of CHALK to 4.00m bgl (LEWES NODULAR CHALK FORMATION). WS5 – Silty, sandy CLAY to 2.00m bgl (RTD), Very loose very silty very clayey SAND to 3.50m bgl (RTD), SAND to 4.00m bgl (RTD). WS6 – Silty, sandy CLAY to 2.00m bgl (RTD), Very loose very silty very clayey SAND to 3.80m bgl (RTD), SILT of CHALK to 4.00m bgl (LEWES NODULAR CHALK FORMATION).
Greenfield run-off rate (Qbar):	4.02l/s – 2.8l/s for the 0.94 Ha. positively drained catchment area
Groundwater depth:	Investigation from November 2019 to March 2020, peaking at; WS1 - 0.50m bgl WS2 – 1.20m bgl WS3 – 0.45m bgl WS4 – 0.46m bgl WS5 – 0.29m bgl WS6 – 0.55m bgl
Soil infiltration rate:	Infiltration not deemed suitable given the presence of high groundwater.
Nearby watercourse:	Ordinary watercourse located on the north-western/western boundary, as well as to the south-east of site access
Nearby surface water sewer:	No
Proposed method of disposal and reason:	To existing watercourse due to the presence of high groundwater
Design storms considered:	1:100 year

Climate change:	40%
Urban creep:	10%
Proposed catchment area:	5,213m ² (excludes free-draining gravel area @ 845m ²)
Proposed discharge Rate:	4.00l/s
Flow control method	Induced vortex e.g. Hydrobrake
Volume of storage provided and method:	• 133m³ cellular tank (350m², 400mm deep, 95% voids) • 228m³ permeable paving (1,585m², 450mm sub-base, 32% voids)
Offsite works:	Existing ditch downstream of proposed discharge points to be cleared to ensure both are free flowing, without obstructions. Riparian ownership responsibilities to be undertaken to ensure long-term effectiveness.

Foul Water Drainage Design Summary

Number of properties:	23 residential dwellings
Point of discharge:	Existing foul water manhole (7701) located in Burndell Road
Method of discharge:	Pumped
Rate of discharge:	3.5l/s (minimum self-cleansing velocity, subject to confirmation from pump specialist)
24hr emergency storage:	19.8m ³ (at 150l per person, per day)
Off-site works:	Connection to existing sewer in Burndell Road subject to S106 approval from Southern Water.

Flood Risk Summary

Flood zone:	Flood Zone 1 (Figure 1)
Flood risk from rivers/the sea:	'Very Low' (Figure 2)
Flood risk from surface water:	'Very Low' to 'Medium' (Figure 3)
Anticipated depths of surface water flooding:	'Medium' Risk scenario: Below 300mm (Figure 4) 'Low Risk' scenario: Below 300mm to 300-900mm (Figure 5)
Flood risk from reservoirs:	None (Figure 6)
Flood risk from groundwater;	High – peaking at 0.29m below ground level
Flood risk from sewers:	TBC
Other:	Site is located within the 'Lidsey Foul Water Treatment Catchment Area'

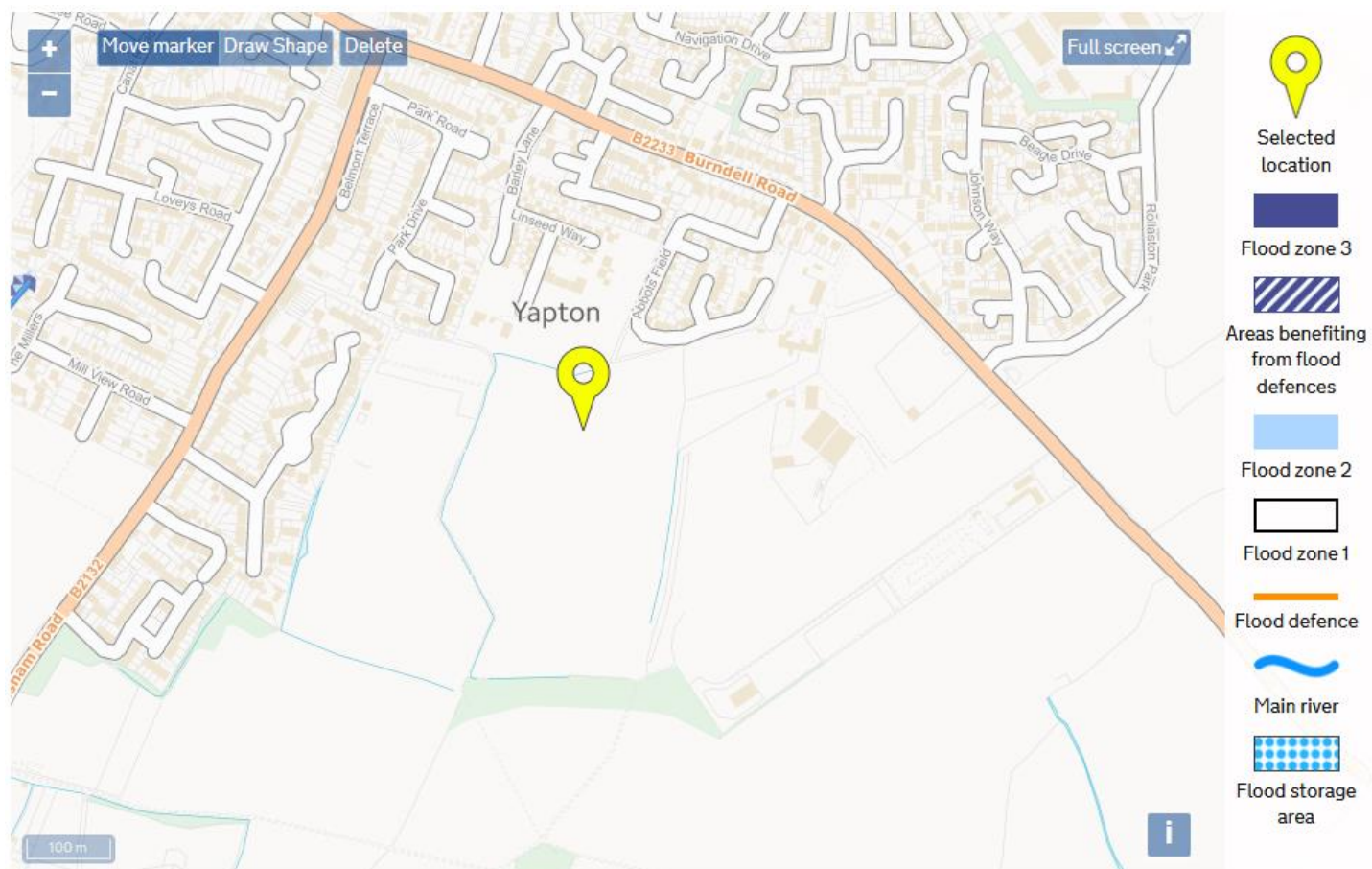


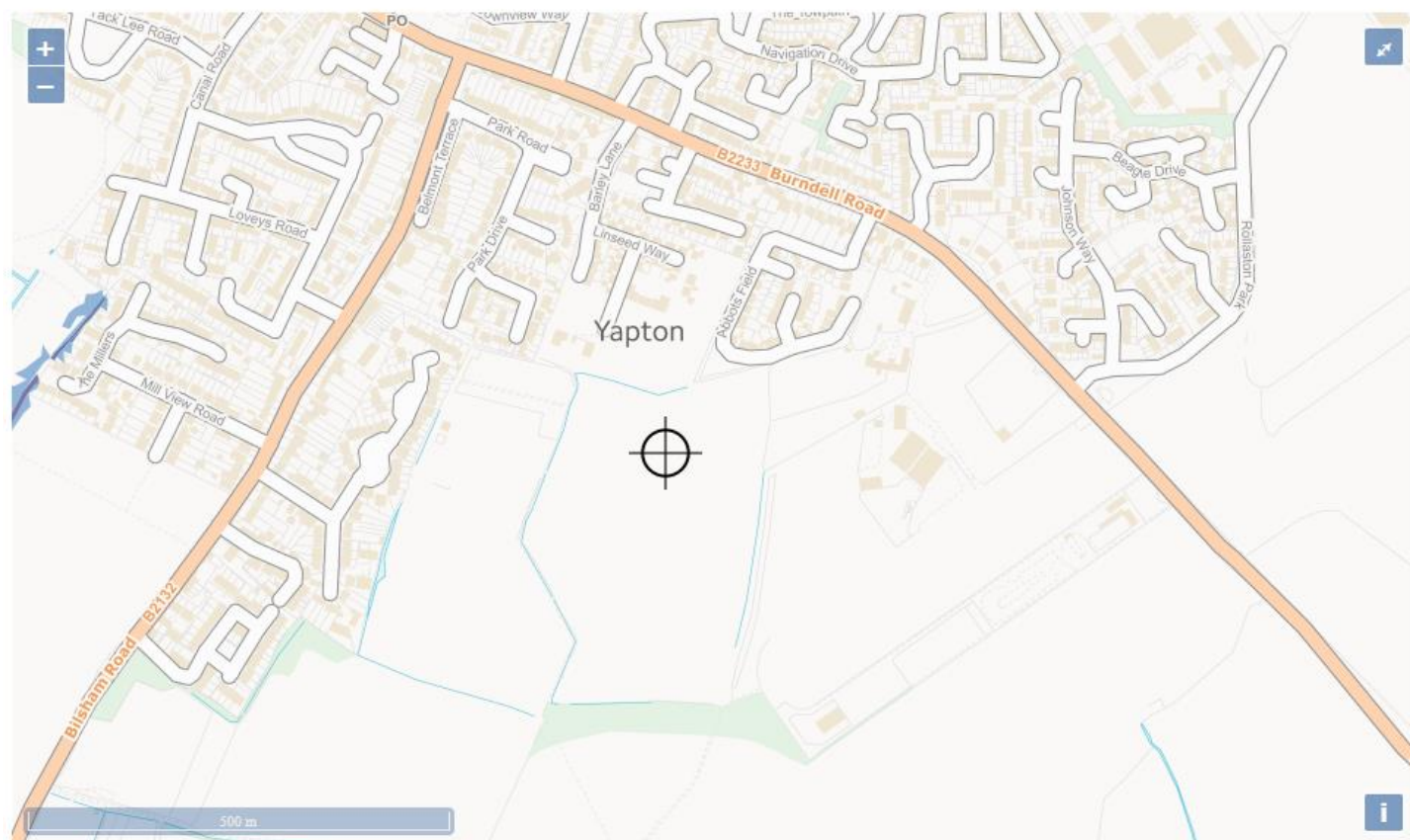
Figure 1 – Flood Maps for Planning

Flood risk

Extent of flooding

Location

Enter a place or postcode



Extent of flooding from rivers or the sea

● High
 ● Medium
 ● Low
 ● Very low
 ⊕ Location you selected

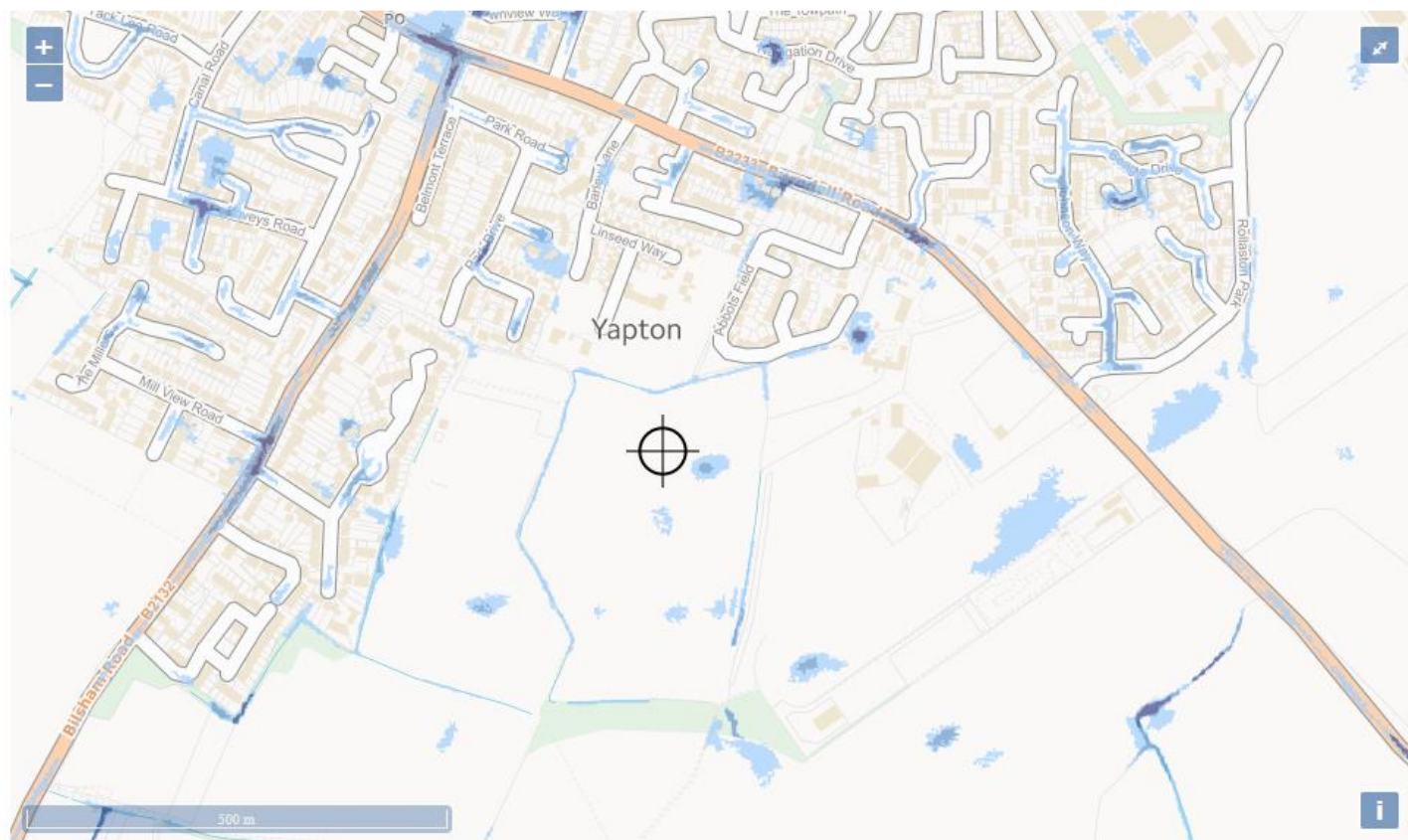
Figure 2 – Long-Term Flood Risk Map; Rivers or the Sea

Flood risk

Extent of flooding

Location

Enter a place or postcode



Extent of flooding from surface water

● High
● Medium
● Low
 Very low
⊕ Location you selected

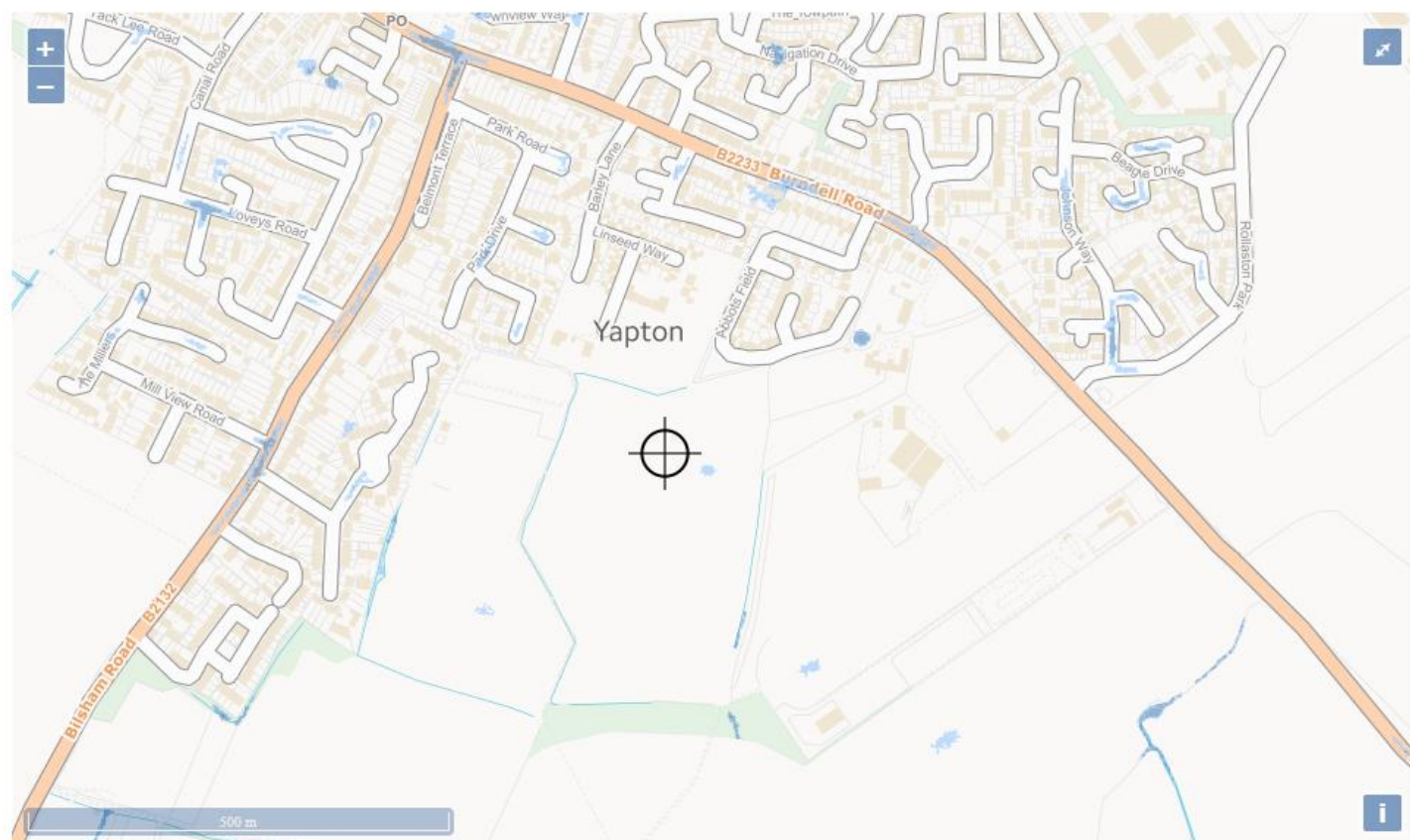
Figure 3 – Long-Term Flood Risk Map; Surface Water

Flood risk

Medium risk: depth

Location

Enter a place or postcode



Surface water flood risk: water depth in a medium risk scenario

Flood depth (millimetres)

● Over 900mm
 ● 300 to 900mm
 ● Below 300mm
 ⊕ Location you selected

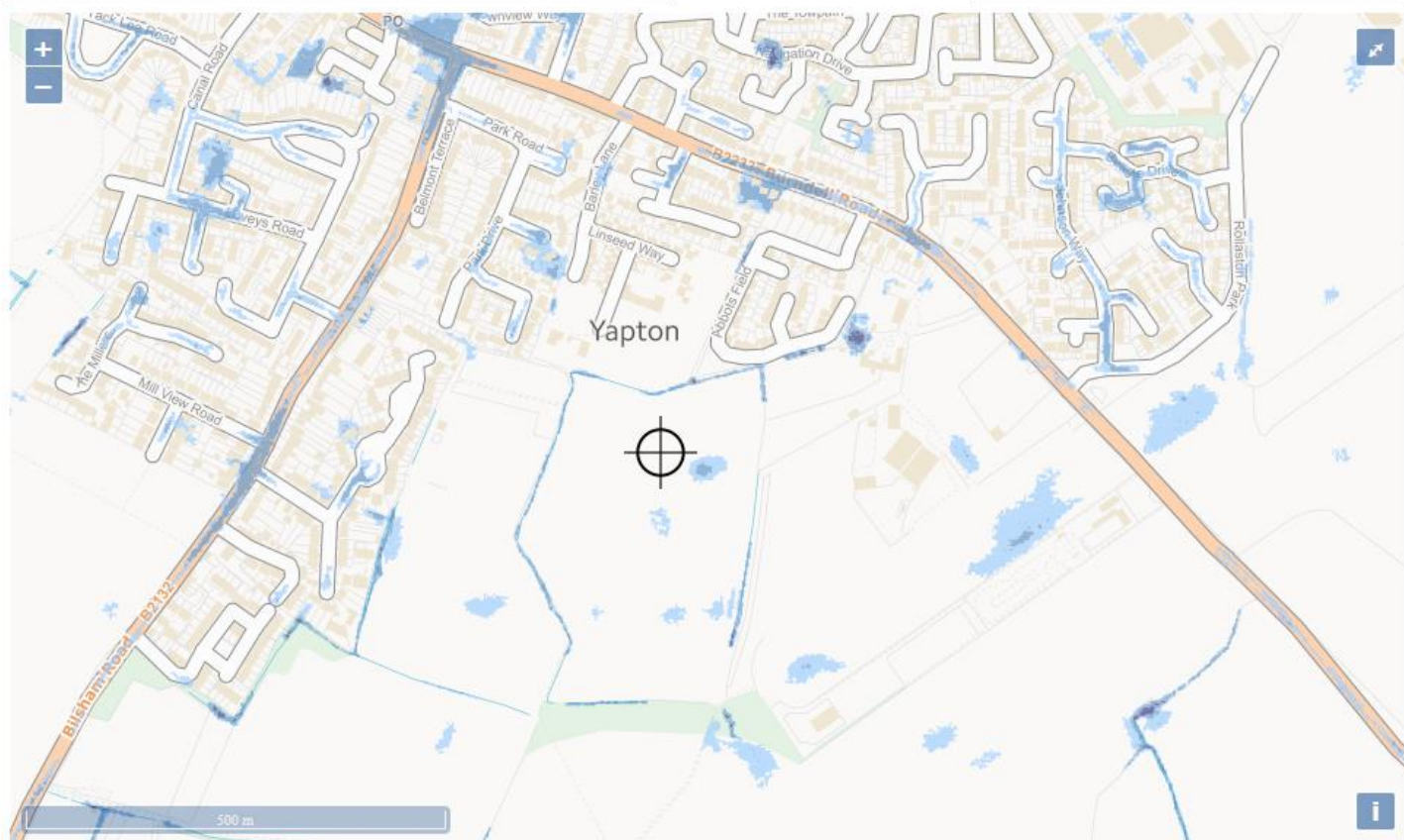
Figure 4 – Long-Term Flood Risk Map; Surface Water – Medium Risk

Flood risk

Low risk: depth

Location

Enter a place or postcode



Surface water flood risk: water depth in a low risk scenario

Flood depth (millimetres)

Over 900mm 300 to 900mm Below 300mm Location you selected

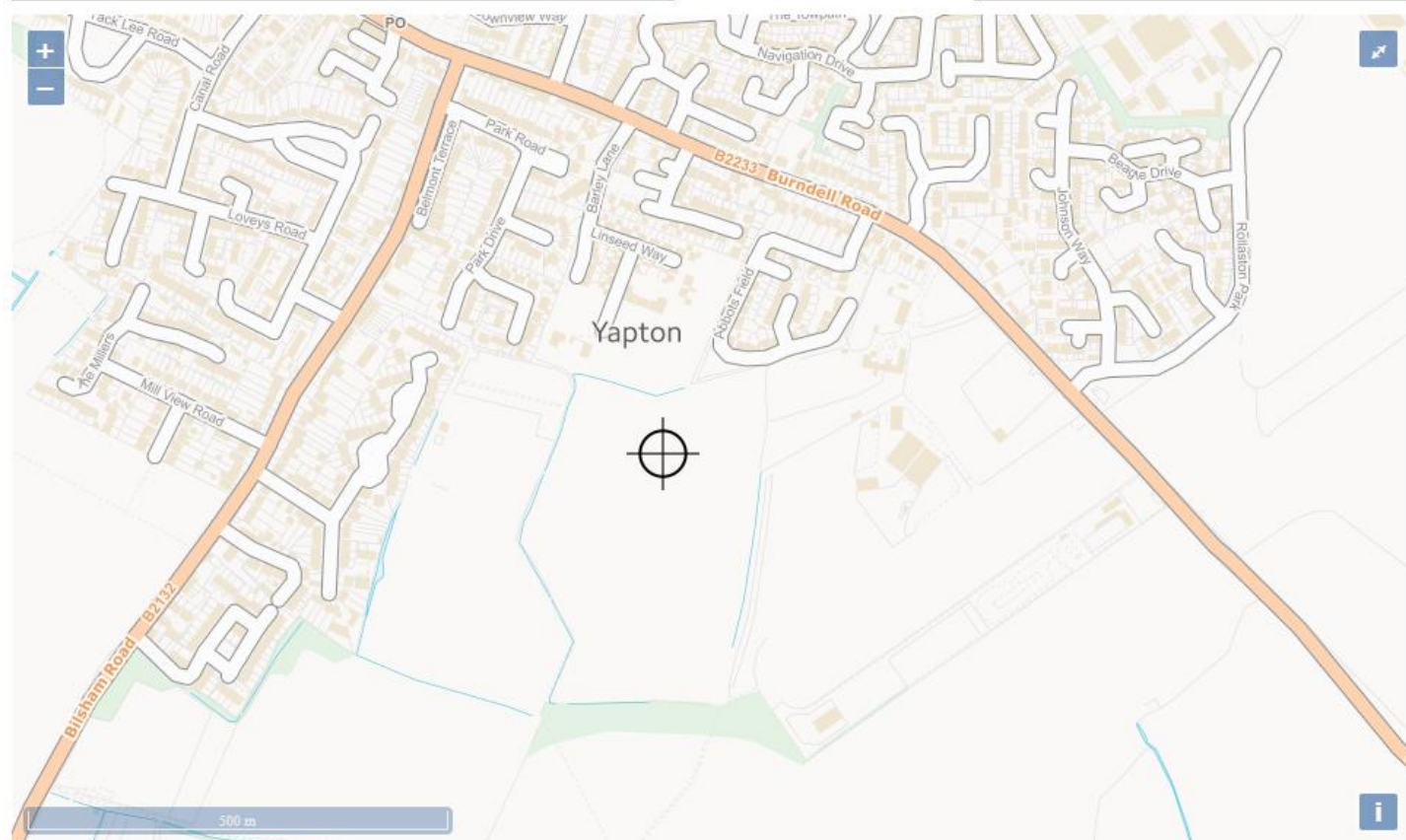
Figure 5 – Long-Term Flood Risk Map; Surface Water – Low Risk

Flood risk

Extent of flooding

Location

Enter a place or postcode



Extent of flooding from reservoirs

● Maximum extent of flooding ⊕ Location you selected

Figure 6 – Long-Term Flood Risk Map; Surface Water – Reservoirs



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4. Any information given regarding existing underground services is given in good faith after consultation with the relevant authority, however accuracy is not certain.

-SITE LOCATION LEGEND-

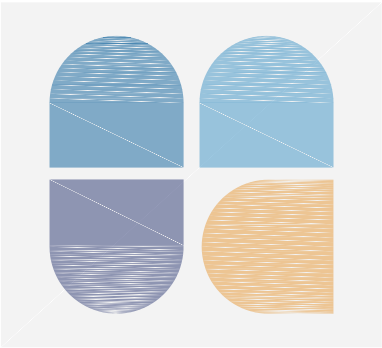
Site Boundary - 13,443 m² (1.34 Ha.)
Site Grid Reference: SU 98540 02689

PLANNING

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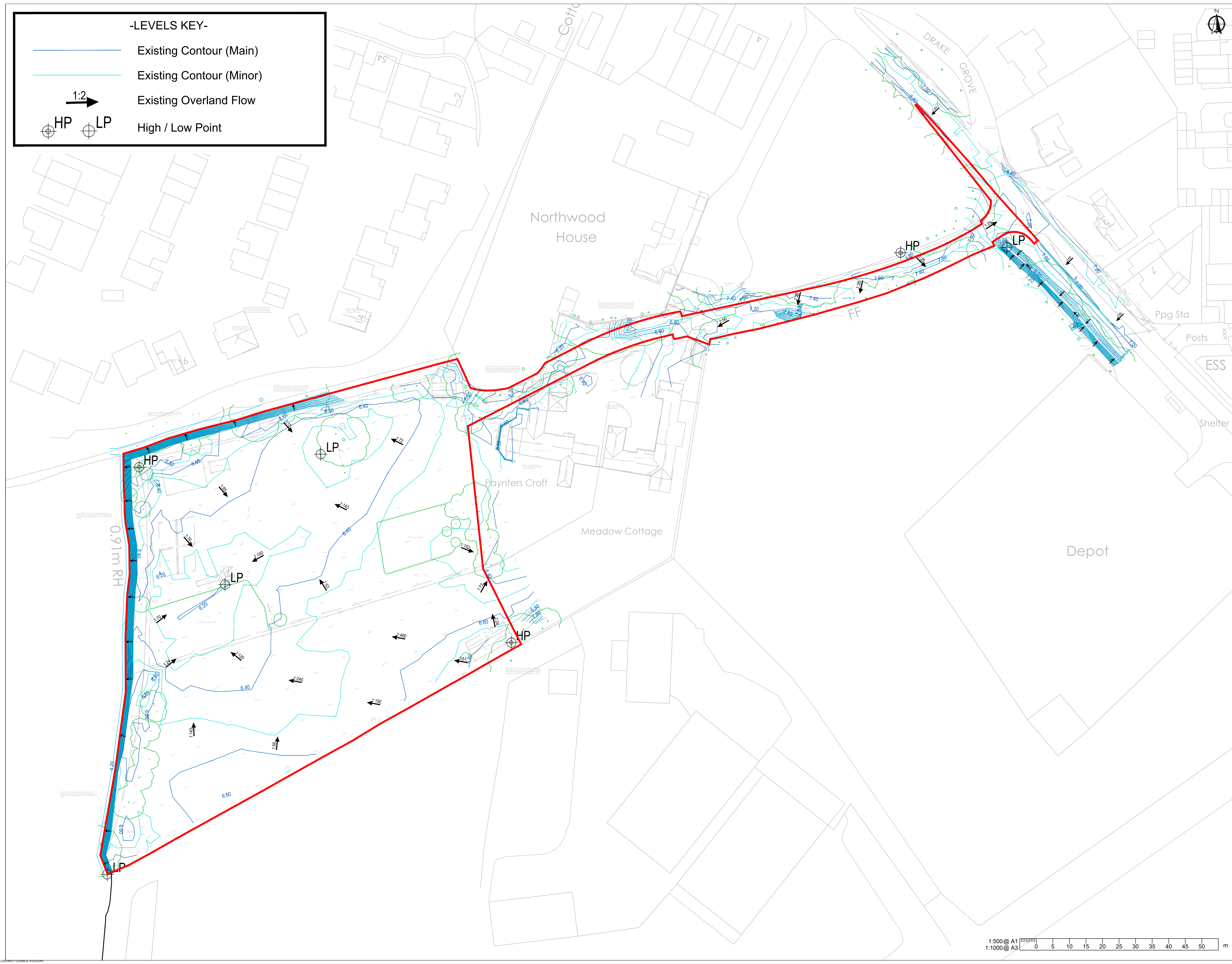
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A	Red line boundary updated	07/09/2021
Rev.	Amendments	Date



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Drawing Status	PLANNING		
Client	Driftstone Developments Ltd		
Project	Site Location Plan		
Drawing Title	Land off Burndell Road, Yapton, West Sussex BN18 0GB		
Scale	1:1250	Date	Oct 2020
Drawn By	DJL	Checked By	MJA
Drawing No.	D1906-100		Rev.
		A	



-LEVELS KEY-

- Existing Contour (Main)
- Existing Contour (Minor)
- Existing Overland Flow
- High / Low Point

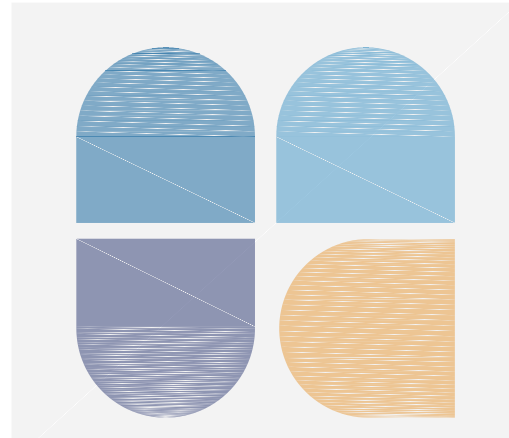
NOTES

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A	Red line boundary updated	07/09/2021
	Original Issue	28/10/2020
Rev.	Amendments	Date



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Drawing Status		PLANNING	
Client		Driftstone Developments Ltd	
Project		Land off Burndell Road Yapton, West Sussex BN18 0GB	
Drawing Title		Existing Topographical Survey & Flow Routes	
Scale	Date	Drawn By	Checked By
1:500	Oct 2020	DJL	MJA
Drawing No.		Rev.	
D1906-200		A	

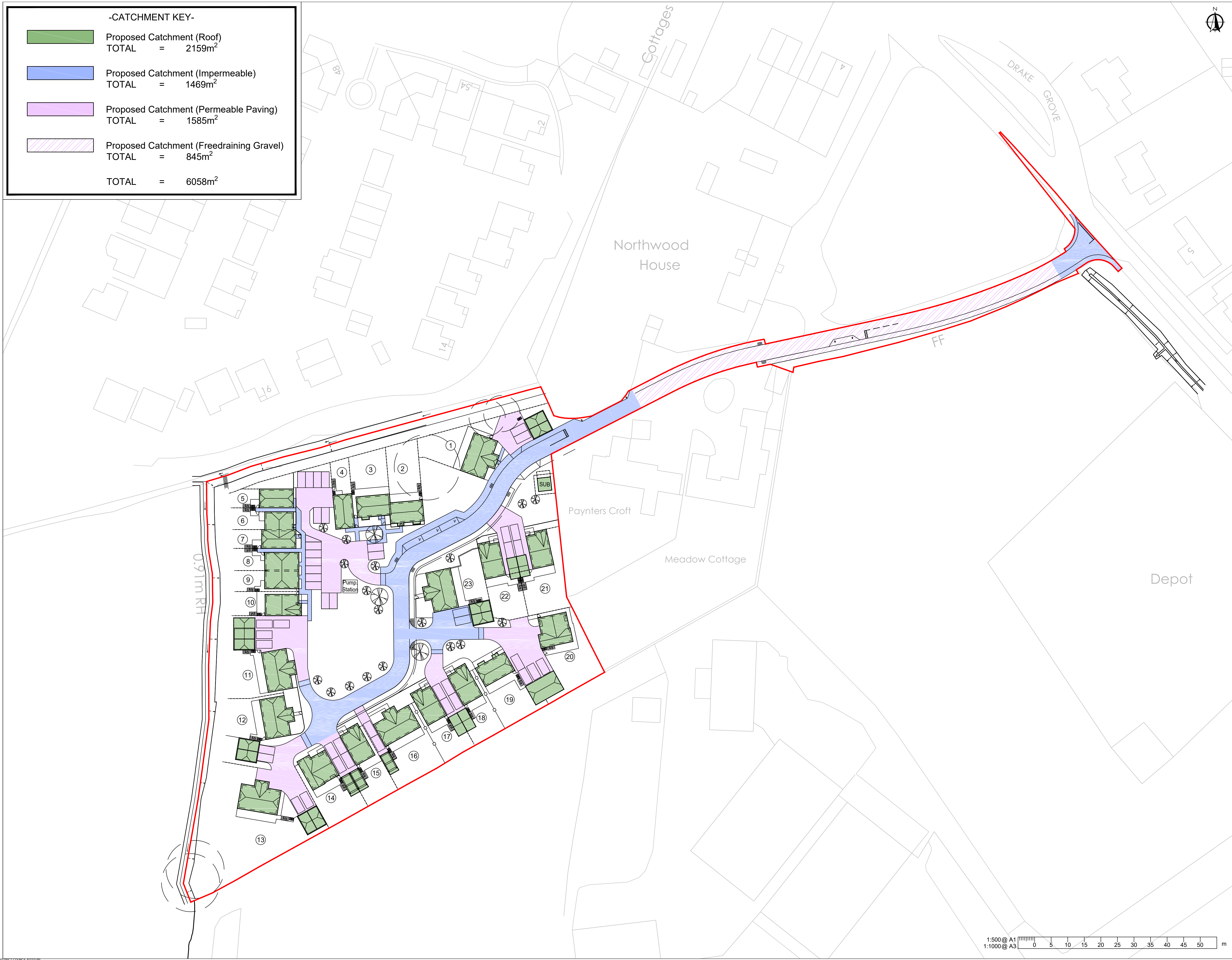
Proposed Catchment (Roof)
TOTAL = 2159m²

Proposed Catchment (Impermeable)
TOTAL = 1469m²

Proposed Catchment (Permeable Paving)
TOTAL = 1585m²

Proposed Catchment (Freedraining Gravel)
TOTAL = 845m²

TOTAL = 6058m²



NOTES

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D	Revised layout	07/09/2021
C	Revised Issue	04/03/2021
B	Revised Issue	14/01/2021
A	Revised Issue	05/11/2020
-	Original Issue	28/10/2020

Rev.	Amendments	Date

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Drawing Status

PLANNING

Client

Driftstone Developments Ltd

Project

Land off Burndell Road
Yapton, West Sussex BN18 0GB

Drawing Title

Impermeable Areas

Scale

1:500

Date

Mar 2021

Drawn By

DJL

Checked By

MJA

Drawing No.

D1906-300

Rev.

D

-DRAINAGE KEY-

Existing Foul Water Drain/Sewer

Existing Watercourse

Existing Culvert (Surface Water)

Watercourse Buffer Zone (3m, however 5m for structures) (Measured from Top of Bank)

Top of Watercourse Bank

Highway Boundary

Site Boundary

Root Protection Zone

The main site plan illustrates a residential development with 23 numbered plots. A blue stream flows through the site, with specific levels noted: IL 5.150, IL 4.660, IL 4.110, and IL 4.050. A red line delineates the site boundary, while a dashed orange line indicates the top of the watercourse bank. A yellow buffer zone is shown around the watercourse. Infrastructure includes a 'Pump Station' and a 'SUB' (substation). Surrounding areas are labeled: 'Northwood House', 'Paynters Croft', 'Meadow Cottage', and 'Depot'. A 'POSSIBLE CULVERT/ DITCH ROUTE' is marked. A note states: 'TIE IN TO EXISTING PROPERTIES DRIVEWAYS REQUIRED FOR ACCESS ROAD'. Another note mentions: '3.0 METRE MAINTENANCE BUFFER REQUIRED FOR WATERCOURSE- GARDENS CANT ENCROACH'. A reference to another drawing is provided: 'TOP OF WATERCOURSE BANK (SEE DRAWING D1906-200 FOR CONTOURS). 3.0 METRE BUFFER ZONE REQUIRED'. A 'LAYOUT DESIGNED IN ACCORDANCE WITH WATERCOURSE BUFFER ZONE - ARUN & WSCC POLICY' is noted in two locations. A 'Root Protection Zone' is indicated by a red hatched area. A 'Highway Boundary' is shown with a dashed black line. A 'Site Boundary' is shown with a solid red line. A 'Foul Water Drain/Sewer' is shown with a dashed purple line. A 'Watercourse' is shown with a solid blue line. A 'Culvert' is shown with a dashed blue line. A 'Buffer Zone' is shown with a yellow hatched area. A 'Top of Watercourse Bank' is shown with a dashed orange line. A 'Highway Boundary' is shown with a dashed black line. A 'Site Boundary' is shown with a solid red line. A 'Root Protection Zone' is indicated by a red hatched area.

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D

Revised layout

07/09/2021

C

Revised Issue

04/03/2021

B

Revised Issue

14/01/2021

A

Revised Issue

08/11/2020

-

Original Issue

29/10/2020

Rev

Amendments

Date

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Drawing Status

PLANNING

Client

Driftstone Developments Ltd

Project

Land off Burndell Road
Yapton, West Sussex BN18 0GB

Drawing Title

Existing Constraints Appraisal

Scale

1:500

Date

Mar 2021

Drawn By

DJL

Checked By

MJA

Drawing No.

D1906-400

Rev.

D

ARUN DISTRICT COUNCIL P2022/DPL

-LEVELS KEY-

- +10.850 Proposed Spot Level
- FFL ### Proposed Finished Floor Level
- ➡ Overland Flow Arrow
- ⊕ LP Ultimate Low Point

-DRAINAGE KEY-

- Existing Surface Water Drain/Sewer
- Proposed Surface Water Drain/Sewer
- Ordinary Watercourse
- Permeable Pavement (Infiltration or Tanked)
- Existing Foul Water Drain/Sewer
- Foul Water (Private Drain/Public Sewer)
- Proposed FW Manhole
- Ordinary Watercourse 3m & 5m Buffers
- 450sq Storm Road Gully (Single/Double)
- Root Protection Zone (Refer to Arb Report)

EXISTING DRAINAGE ON SITE UNKNOWN.

THE CONTRACTOR IS RESPONSIBLE FOR DEALING WITH THE EXISTING DRAINAGE INFRASTRUCTURE AND REPORTING CONNECTIVITY & CONDITION TO ENGINEER.

BUILDING FOUNDATION & MAIN SERVICE CORRIDOR 'LINE & LEVEL' SHALL BE DESIGNED TO SUIT THE DRAINAGE STRATEGY.

Refer to Architects drawings for further information on plot internal detailing, service points and threshold drainage details. Architect to finalise all drainage connection points & threshold drainage requirements

-SURFACE WATER STRATEGY-

- Surface water disposal should be managed in view of the SuDS hierarchy;
 - Infiltration
 - Watercourse
 - Public Surface Water Sewer(s)
- Site-specific geotechnical investigation found high groundwater across the site, limiting the use of infiltration features or deep SuDS. It is however proposed for existing driveway to remain as freedrainng gravel structure given the higher levels and soakage rates of ~10".
- It is proposed to use permeable paving on the driveways and minor roads, however given restrictions with high groundwater it is considered that this will need to be tanked. The proposed drainage system will discharge into a 402.5sq.m, 0.4m deep geocellular tank, with a controlled discharge rate of 2.8lit/s to the watercourse. The tank will also need to be lined, however the invert level has been set above maximum recorded groundwater levels.
- The drainage strategy has been designed for up to a 1-in-100 year storm event, with the allowance of 40% for climate change and 10% urban creep.
- Finished floor levels are to be set above existing ground levels, to limit risk of internal flooding from surface water or drainage exceedance event. Site level raising will also allow SuDS to be above groundwater levels.
- It is proposed that adjacent to the highway, where the entrance road falls away from the rest of the site, the runoff is captured by road gullies and oversized pipes, and discharged to the highway ditch with an Orifice Chamber designed to limit runoff and attenuate within the system.

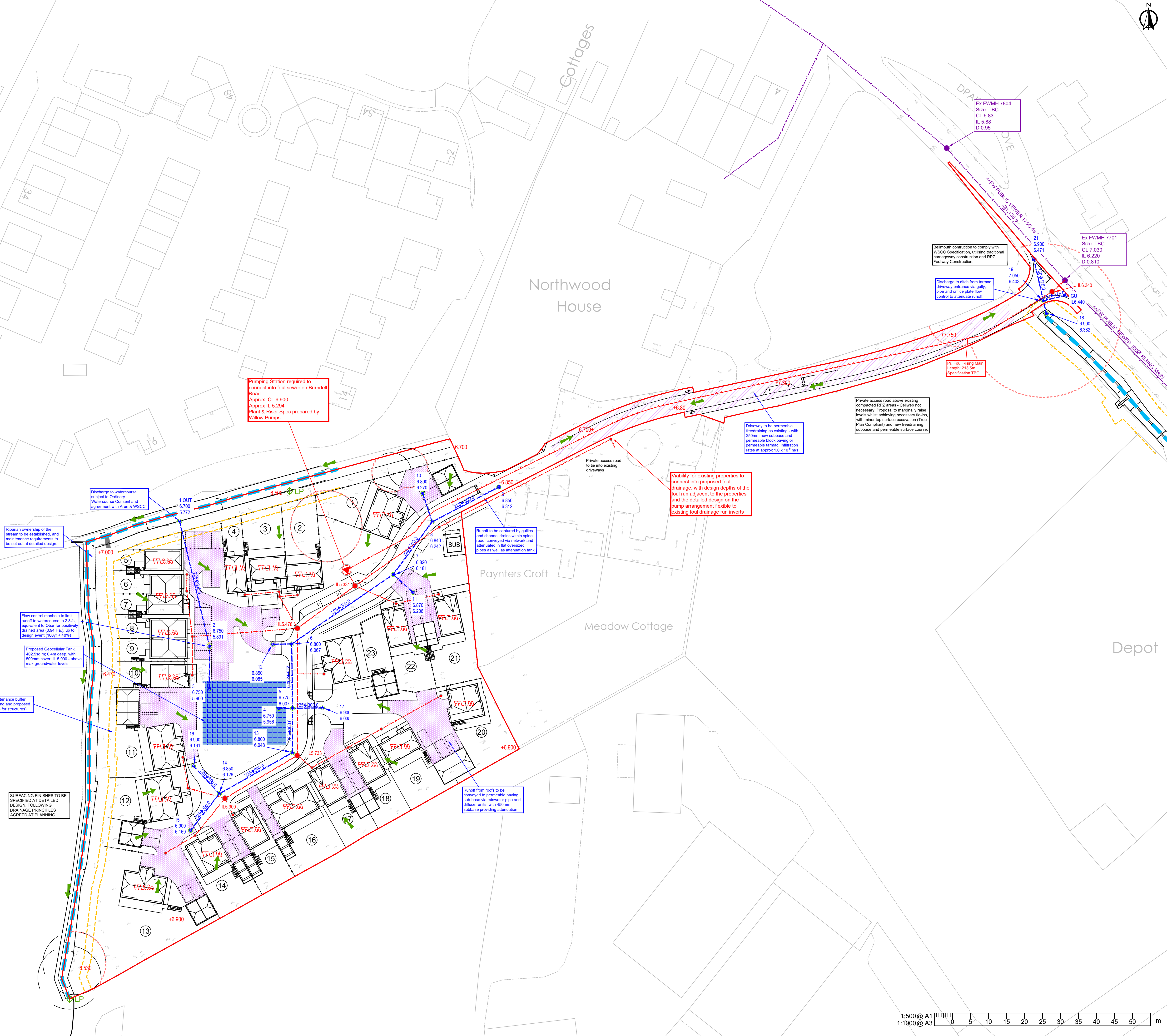
-FOUL WATER STRATEGY-

- Foul water disposal should adhere to the following hierarchy;
 - Public Sewer
 - Private Treatment Plant
 - Septic Tank and Drainage Field
 - Cesspool
- The proposed development will discharge into the existing public foul sewer.
- It is proposed to discharge this to the public foul sewer on Burndell Road, however a foul pump and rising main will be required to connect into the Southern Water foul main.
- Indicative design is shown for the foul pump, to be confirmed.

-FOUL SYSTEM DESIGN-

PROPOSED FW DRAIN NETWORK

Estimated foul invert levels are based on a minimum pipe slope of 1:135 and 150mm diameter proposed foul drains across the network, to demonstrate connectivity and capacity. Slopes and capacity to be refined where possible at detailed design to ensure cost efficient design.



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F	Revised Issue	04/01/2022
E	Revised layout	07/09/2021
D	Revised Issue	04/03/2021
C	Revised Issue	14/01/2021
B	Revised Issue	08/12/2020
A	Revised Issue	06/11/2020
-	Original Issue	29/10/2020
Rev	Amendments	Date



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Drawing Status **PLANNING**

Client **Driftstone Developments Ltd**

Project **Land off Burndell Road, Yapton, West Sussex BN18 0GB**

Drawing Title **Surface & Foul Water Drainage Strategy**

Scale **1:500** Date **Jan 2022** Drawn By **DJL** Checked By **MJA**

Drawing No. **D1906-500** Rev. **F**

Calculated by:	Daniel Lytton
Site name:	Land off Burndell Road
Site location:	BN18 0GB

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	50.81486° N
Longitude:	0.60461° W
Reference:	2154385384
Date:	Oct 28 2020 17:44

Runoff estimation approach

Site characteristics

Total site area (ha):	1.34
-----------------------	-----------------------------------

Methodology

Q _{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	3	3
HOST class:	N/A	N/A
SPR/SPRHOST:	0.37	0.37

Hydrological characteristics

	Default	Edited
SAAR (mm):	727	727
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q _{BAR} (l/s):	4.02	4.02
1 in 1 year (l/s):	3.42	3.42
1 in 30 years (l/s):	9.25	9.25
1 in 100 year (l/s):	12.84	12.84
1 in 200 years (l/s):	15.05	15.05

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Calculated by:

Site name:

Site location:

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:

Longitude:

Reference:

Date:

Runoff estimation approach

Site characteristics

Total site area (ha):

Methodology

Q_{BAR} estimation method:

SPR estimation method:

Soil characteristics	Default	Edited
SOIL type:	3	3
HOST class:	N/A	N/A
SPR/SPRHOST:	0.37	0.37

Hydrological characteristics

	Default	Edited
SAAR (mm):	727	727
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	2.82	2.82
1 in 1 year (l/s):	2.4	2.4
1 in 30 years (l/s):	6.49	6.49
1 in 100 year (l/s):	9	9
1 in 200 years (l/s):	10.56	10.56

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Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	250.0
Additional Flow (%)	10	Minimum Velocity (m/s)	0.75
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)	0.450
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
21	0.007	5.00	6.900	1200	0.429
20	0.007	5.00	6.990	1200	0.550
19			7.050	1200	0.647
18			6.900	1200	0.518
17	0.094	5.00	6.900	1200	0.865
16	0.036	5.00	6.900	1200	0.739
15	0.049	5.00	6.900	1200	0.731
14	0.044	5.00	6.850	1200	0.724
13	0.042	5.00	6.800	1350	0.752
12	0.049	5.00	6.850	1200	0.765
11	0.031	5.00	6.870	1200	0.664
10	0.024	5.00	6.890	1200	0.620
9	0.017	5.00	6.850	1200	0.538
8	0.019	5.00	6.840	1200	0.598
7	0.017	5.00	6.820	1200	0.639
6	0.084	5.00	6.800	1350	0.733
5			6.775	1500	0.768
4	0.000	5.00	6.750	1500	0.794
3			6.750	1500	0.850
2			6.750	1500	0.859
1			6.700	1500	0.928

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.007	35.675	300.0	225	6.750	5.891	0.634	6.700	5.772	0.703
1.006	2.664	300.0	225	6.750	5.900	0.625	6.750	5.891	0.634
1.005	16.654	300.0	225	6.750	5.956	0.569	6.750	5.900	0.625
1.004	15.305	300.0	225	6.775	6.007	0.543	6.750	5.956	0.569
7.000	8.332	300.0	225	6.900	6.035	0.640	6.775	6.007	0.543
5.002	12.350	300.0	225	6.800	6.048	0.527	6.775	6.007	0.543

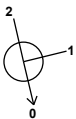
Link	US Node	DS Node
1.007	2	1
1.006	3	2
1.005	4	3
1.004	5	4
7.000	17	5
5.002	13	5

Pipeline Schedule

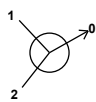
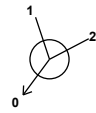
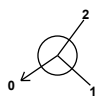
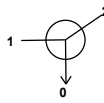
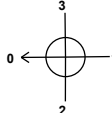
Link	Length (m)	Slope (1:X)	Dia (mm)	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.003	17.877	300.0	225	6.800	6.067	0.508	6.775	6.007	0.543
4.000	5.269	300.0	225	6.850	6.085	0.540	6.800	6.067	0.508
1.002	34.157	300.0	225	6.820	6.181	0.414	6.800	6.067	0.508
3.000	7.405	300.0	225	6.870	6.206	0.439	6.820	6.181	0.414
1.001	18.187	300.0	225	6.840	6.242	0.373	6.820	6.181	0.414
2.000	8.336	300.0	225	6.890	6.270	0.395	6.840	6.242	0.373
1.000	20.900	300.0	225	6.850	6.312	0.313	6.840	6.242	0.373
5.001	23.261	300.0	225	6.850	6.126	0.499	6.800	6.048	0.527
6.000	10.584	300.0	225	6.900	6.161	0.514	6.850	6.126	0.499
5.000	12.955	300.0	225	6.900	6.169	0.506	6.850	6.126	0.499
8.001	3.644	175.0	150	7.050	6.403	0.497	6.900	6.382	0.368
8.000	11.918	175.0	150	6.900	6.471	0.279	7.050	6.403	0.497
9.000	6.474	175.0	150	6.990	6.440	0.400	7.050	6.403	0.497

Link	US Node	DS Node
1.003	6	5
4.000	12	6
1.002	7	6
3.000	11	7
1.001	8	7
2.000	10	8
1.000	9	8
5.001	14	13
6.000	16	14
5.000	15	14
8.001	19	18
8.000	21	19
9.000	20	19

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
21	6.900	0.429	1200		0	8.000	6.471	150
20	6.990	0.550	1200		0	9.000	6.440	150
19	7.050	0.647	1200		1 2 0	9.000 8.000 8.001	6.403 6.403 6.403	150 150 150
18	6.900	0.518	1200		1	8.001	6.382	150

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
17	6.900	0.865	1200					
				0	7.000	6.035	225	
16	6.900	0.739	1200					
				0	6.000	6.161	225	
15	6.900	0.731	1200					
				0	5.000	6.169	225	
14	6.850	0.724	1200		1 2	6.000 5.000	6.126 6.126	225 225
				0	5.001	6.126	225	
13	6.800	0.752	1350		1	5.001	6.048	225
				0	5.002	6.048	225	
12	6.850	0.765	1200					
				0	4.000	6.085	225	
11	6.870	0.664	1200					
				0	3.000	6.206	225	
10	6.890	0.620	1200					
				0	2.000	6.270	225	
9	6.850	0.538	1200					
				0	1.000	6.312	225	
8	6.840	0.598	1200		1 2	2.000 1.000	6.242 6.242	225 225
				0	1.001	6.242	225	
7	6.820	0.639	1200		1 2	3.000 1.001	6.181 6.181	225 225
				0	1.002	6.181	225	
6	6.800	0.733	1350		1 2	4.000 1.002	6.067 6.067	225 225
				0	1.003	6.067	225	
5	6.775	0.768	1500		1 2 3	7.000 5.002 1.003	6.007 6.007 6.007	225 225 225
				0	1.004	6.007	225	

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
4	6.750	0.794	1500		1	1.004	5.956	225
3	6.750	0.850	1500		1	1.005	5.900	225
2	6.750	0.859	1500		1	1.006	5.891	225
1	6.700	0.928	1500		1	1.007	5.772	225

Node 2 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	5.891	Product Number	CTL-SHE-0082-2800-0859-2800
Design Depth (m)	0.859	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.8	Min Node Diameter (mm)	1200

Node 19 Online Orifice Control

Flap Valve	x	Invert Level (m)	6.403	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Diameter (m)	0.060		

Node 3 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	5.900	Depth (m)	0.400
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Inf Depth (m)	
Safety Factor	1.0	Pit Width (m)	23.000	Number Required	1
Porosity	0.95	Pit Length (m)	17.500		

Node 10 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	6.330	Slope (1:X)	250.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.450
Safety Factor	1.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.32	Length (m)	9.916		

Node 11 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	6.310	Slope (1:X)	250.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.450
Safety Factor	1.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.32	Length (m)	13.518		

Node 12 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	6.290	Slope (1:X)	250.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.450
Safety Factor	1.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.32	Length (m)	48.573		

Node 13 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	6.240	Slope (1:X)	250.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.450
Safety Factor	1.0	Width (m)	4.843	Inf Depth (m)	
Porosity	0.32	Length (m)	10.000		

Node 14 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	6.290	Slope (1:X)	250.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.450
Safety Factor	1.0	Width (m)	7.653	Inf Depth (m)	
Porosity	0.32	Length (m)	10.000		

Node 15 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	6.340	Slope (1:X)	250.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.450
Safety Factor	1.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.32	Length (m)	20.998		

Node 16 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	6.340	Slope (1:X)	250.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.450
Safety Factor	1.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.32	Length (m)	20.073		

Node 17 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	6.340	Slope (1:X)	250.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.450
Safety Factor	1.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.32	Length (m)	32.964		

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	109.521	30.991
1 year 15 minute winter	76.857	30.991
1 year 30 minute summer	71.439	20.215
1 year 30 minute winter	50.133	20.215
1 year 60 minute summer	48.435	12.800
1 year 60 minute winter	32.179	12.800
1 year 120 minute summer	30.053	7.942
1 year 120 minute winter	19.966	7.942
1 year 180 minute summer	23.233	5.979
1 year 180 minute winter	15.102	5.979



Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 240 minute summer	18.475	4.882
1 year 240 minute winter	12.274	4.882
1 year 360 minute summer	14.169	3.646
1 year 360 minute winter	9.210	3.646
1 year 480 minute summer	11.185	2.956
1 year 480 minute winter	7.431	2.956
1 year 600 minute summer	9.182	2.511
1 year 600 minute winter	6.274	2.511
1 year 720 minute summer	8.203	2.199
1 year 720 minute winter	5.513	2.199
1 year 960 minute summer	6.768	1.782
1 year 960 minute winter	4.483	1.782
1 year 1440 minute summer	4.949	1.326
1 year 1440 minute winter	3.326	1.326
30 year 15 minute summer	268.706	76.035
30 year 15 minute winter	188.566	76.035
30 year 30 minute summer	174.929	49.499
30 year 30 minute winter	122.757	49.499
30 year 60 minute summer	116.589	30.811
30 year 60 minute winter	77.459	30.811
30 year 120 minute summer	70.438	18.615
30 year 120 minute winter	46.797	18.615
30 year 180 minute summer	53.298	13.715
30 year 180 minute winter	34.645	13.715
30 year 240 minute summer	41.604	10.995
30 year 240 minute winter	27.641	10.995
30 year 360 minute summer	31.221	8.034
30 year 360 minute winter	20.295	8.034
30 year 480 minute summer	24.324	6.428
30 year 480 minute winter	16.160	6.428
30 year 600 minute summer	19.756	5.404
30 year 600 minute winter	13.498	5.404
30 year 720 minute summer	17.490	4.687
30 year 720 minute winter	11.754	4.687
30 year 960 minute summer	14.215	3.743
30 year 960 minute winter	9.416	3.743
30 year 1440 minute summer	10.161	2.723
30 year 1440 minute winter	6.829	2.723
100 year 15 minute summer	348.738	98.681
100 year 15 minute winter	244.728	98.681
100 year 30 minute summer	228.965	64.789
100 year 30 minute winter	160.677	64.789
100 year 60 minute summer	153.288	40.510
100 year 60 minute winter	101.841	40.510
100 year 120 minute summer	92.562	24.461
100 year 120 minute winter	61.496	24.461
100 year 180 minute summer	69.806	17.964
100 year 180 minute winter	45.376	17.964
100 year 240 minute summer	54.269	14.342
100 year 240 minute winter	36.055	14.342
100 year 360 minute summer	40.484	10.418
100 year 360 minute winter	26.315	10.418



Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year 480 minute summer	31.414	8.302
100 year 480 minute winter	20.871	8.302
100 year 600 minute summer	25.431	6.956
100 year 600 minute winter	17.376	6.956
100 year 720 minute summer	22.452	6.017
100 year 720 minute winter	15.089	6.017
100 year 960 minute summer	18.166	4.784
100 year 960 minute winter	12.033	4.784
100 year 1440 minute summer	12.896	3.456
100 year 1440 minute winter	8.667	3.456
100 year +40% CC 15 minute summer	488.233	138.153
100 year +40% CC 15 minute winter	342.620	138.153
100 year +40% CC 30 minute summer	320.551	90.705
100 year +40% CC 30 minute winter	224.948	90.705
100 year +40% CC 60 minute summer	214.603	56.713
100 year +40% CC 60 minute winter	142.577	56.713
100 year +40% CC 120 minute summer	129.587	34.246
100 year +40% CC 120 minute winter	86.094	34.246
100 year +40% CC 180 minute summer	97.729	25.149
100 year +40% CC 180 minute winter	63.526	25.149
100 year +40% CC 240 minute summer	75.977	20.078
100 year +40% CC 240 minute winter	50.477	20.078
100 year +40% CC 360 minute summer	56.677	14.585
100 year +40% CC 360 minute winter	36.841	14.585
100 year +40% CC 480 minute summer	43.979	11.622
100 year +40% CC 480 minute winter	29.219	11.622
100 year +40% CC 600 minute summer	35.604	9.738
100 year +40% CC 600 minute winter	24.327	9.738
100 year +40% CC 720 minute summer	31.433	8.424
100 year +40% CC 720 minute winter	21.125	8.424
100 year +40% CC 960 minute summer	25.432	6.697
100 year +40% CC 960 minute winter	16.847	6.697
100 year +40% CC 1440 minute summer	18.055	4.839
100 year +40% CC 1440 minute winter	12.134	4.839
100 year +40% CC +10% A 15 minute summer	488.233	138.153
100 year +40% CC +10% A 15 minute winter	342.620	138.153
100 year +40% CC +10% A 30 minute summer	320.551	90.705
100 year +40% CC +10% A 30 minute winter	224.948	90.705
100 year +40% CC +10% A 60 minute summer	214.603	56.713
100 year +40% CC +10% A 60 minute winter	142.577	56.713
100 year +40% CC +10% A 120 minute summer	129.587	34.246
100 year +40% CC +10% A 120 minute winter	86.094	34.246
100 year +40% CC +10% A 180 minute summer	97.729	25.149
100 year +40% CC +10% A 180 minute winter	63.526	25.149
100 year +40% CC +10% A 240 minute summer	75.977	20.078
100 year +40% CC +10% A 240 minute winter	50.477	20.078
100 year +40% CC +10% A 360 minute summer	56.677	14.585
100 year +40% CC +10% A 360 minute winter	36.841	14.585
100 year +40% CC +10% A 480 minute summer	43.979	11.622
100 year +40% CC +10% A 480 minute winter	29.219	11.622
100 year +40% CC +10% A 600 minute summer	35.604	9.738
100 year +40% CC +10% A 600 minute winter	24.327	9.738



Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year +40% CC +10% A 720 minute summer	31.433	8.424
100 year +40% CC +10% A 720 minute winter	21.125	8.424
100 year +40% CC +10% A 960 minute summer	25.432	6.697
100 year +40% CC +10% A 960 minute winter	16.847	6.697
100 year +40% CC +10% A 1440 minute summer	18.055	4.839
100 year +40% CC +10% A 1440 minute winter	12.134	4.839

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.78%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	21	10	6.498	0.027	1.0	0.0393	0.0000	OK
15 minute winter	20	12	6.478	0.038	1.0	0.0527	0.0000	OK
15 minute winter	19	12	6.478	0.075	1.7	0.0849	0.0000	OK
15 minute summer	18	1	6.382	0.000	1.5	0.0000	0.0000	OK
15 minute winter	17	12	6.291	0.256	13.3	0.8459	0.0000	SURCHARGED
15 minute winter	16	13	6.313	0.152	5.1	0.3204	0.0000	OK
15 minute winter	15	13	6.313	0.144	6.9	0.3551	0.0000	OK
15 minute winter	14	13	6.312	0.186	15.1	0.5892	0.0000	OK
15 minute winter	13	13	6.302	0.254	17.4	1.2974	0.0000	SURCHARGED
15 minute winter	12	13	6.324	0.239	6.9	1.0548	0.0000	SURCHARGED
15 minute winter	11	13	6.333	0.127	4.4	0.4674	0.0000	OK
15 minute winter	10	13	6.337	0.067	3.4	0.1463	0.0000	OK
15 minute winter	9	11	6.354	0.042	2.4	0.0744	0.0000	OK
15 minute winter	8	13	6.335	0.093	8.2	0.1641	0.0000	OK
15 minute winter	7	13	6.332	0.151	13.4	0.2519	0.0000	OK
15 minute winter	6	13	6.323	0.256	25.0	0.9538	0.0000	SURCHARGED
15 minute winter	5	12	6.287	0.280	44.1	0.4943	0.0000	SURCHARGED
15 minute winter	4	13	6.148	0.192	43.9	0.3394	0.0000	OK
360 minute winter	3	280	6.057	0.157	10.8	60.1748	0.0000	OK
360 minute winter	2	280	6.057	0.166	2.7	0.2937	0.0000	OK
15 minute summer	1	1	5.772	0.000	1.9	0.0000	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)
15 minute winter	21	8.000	19	0.9	0.283	0.071	0.0644	
15 minute winter	20	9.000	19	0.9	0.301	0.064	0.0399	
15 minute winter	19	Orifice	18	1.6				0.9
15 minute winter	17	7.000	5	12.0	0.473	0.403	0.3314	
15 minute winter	16	6.000	14	3.7	0.268	0.125	0.3372	
15 minute winter	15	5.000	14	5.5	0.388	0.186	0.4009	
15 minute winter	14	5.001	13	11.8	0.544	0.395	0.8713	
15 minute winter	13	5.002	5	16.1	0.404	0.539	0.4912	
15 minute winter	12	4.000	6	6.4	0.282	0.216	0.2096	
15 minute winter	11	3.000	7	4.1	0.324	0.137	0.1904	
15 minute winter	10	2.000	8	3.2	0.333	0.107	0.1055	
15 minute winter	9	1.000	8	2.3	0.274	0.078	0.2060	
15 minute winter	8	1.001	7	7.8	0.500	0.261	0.3991	
15 minute winter	7	1.002	6	10.6	0.424	0.355	1.1647	
15 minute winter	6	1.003	5	21.2	0.532	0.710	0.7110	
15 minute winter	5	1.004	4	43.9	1.111	1.473	0.5807	
15 minute winter	4	1.005	3	44.0	2.390	1.476	0.3451	
360 minute winter	3	1.006	2	2.7	0.181	0.091	0.0814	
360 minute winter	2	Hydro-Brake®	1	2.7				69.8

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.78%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	21	13	6.583	0.112	2.4	0.1626	0.0000	OK
15 minute winter	20	13	6.582	0.142	2.4	0.1972	0.0000	OK
15 minute winter	19	13	6.582	0.179	3.2	0.2023	0.0000	SURCHARGED
15 minute summer	18	1	6.382	0.000	2.7	0.0000	0.0000	OK
15 minute winter	17	13	6.416	0.381	32.4	3.5905	0.0000	SURCHARGED
15 minute winter	16	15	6.433	0.272	15.0	3.9551	0.0000	SURCHARGED
15 minute winter	15	15	6.433	0.264	17.0	4.1047	0.0000	SURCHARGED
30 minute winter	14	24	6.432	0.306	25.4	3.6971	0.0000	SURCHARGED
15 minute winter	13	14	6.418	0.370	22.7	3.4007	0.0000	SURCHARGED
30 minute winter	12	25	6.439	0.354	19.4	9.7522	0.0000	SURCHARGED
30 minute winter	11	25	6.452	0.246	13.4	5.4882	0.0000	SURCHARGED
30 minute winter	10	25	6.454	0.184	10.3	3.6600	0.0000	OK
30 minute winter	9	25	6.454	0.142	4.5	0.2507	0.0000	OK
30 minute winter	8	25	6.454	0.212	9.9	0.3744	0.0000	OK
30 minute winter	7	25	6.452	0.271	13.1	0.4502	0.0000	SURCHARGED
30 minute winter	6	24	6.438	0.371	25.6	1.3815	0.0000	SURCHARGED
15 minute winter	5	14	6.403	0.396	51.0	0.6994	0.0000	SURCHARGED
360 minute winter	4	352	6.291	0.335	23.2	0.5912	0.0000	SURCHARGED
360 minute winter	3	352	6.290	0.390	23.0	149.1848	0.0000	SURCHARGED
360 minute winter	2	352	6.290	0.399	2.9	0.7051	0.0000	SURCHARGED
15 minute summer	1	1	5.772	0.000	2.7	0.0000	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)
15 minute winter	21	8.000	19	1.9	0.322	0.141	0.1887	
15 minute winter	20	9.000	19	1.8	0.355	0.135	0.1129	
15 minute winter	19	Orifice	18	2.9				2.3
15 minute winter	17	7.000	5	21.5	0.561	0.722	0.3314	
15 minute winter	16	6.000	14	8.4	0.282	0.280	0.4209	
15 minute winter	15	5.000	14	10.7	0.396	0.360	0.5152	
30 minute winter	14	5.001	13	15.6	0.515	0.525	0.9251	
15 minute winter	13	5.002	5	19.8	0.497	0.663	0.4912	
30 minute winter	12	4.000	6	11.8	0.297	0.397	0.2096	
30 minute winter	11	3.000	7	6.7	0.328	0.225	0.2945	
30 minute winter	10	2.000	8	4.4	0.341	0.149	0.3069	
30 minute winter	9	1.000	8	3.7	0.284	0.126	0.6819	
30 minute winter	8	1.001	7	7.7	0.489	0.260	0.7147	
30 minute winter	7	1.002	6	14.6	0.468	0.489	1.3585	
30 minute winter	6	1.003	5	23.4	0.589	0.786	0.7110	
15 minute winter	5	1.004	4	50.8	1.276	1.703	0.6087	
360 minute winter	4	1.005	3	23.0	1.090	0.771	0.6623	
360 minute winter	3	1.006	2	2.9	0.204	0.097	0.1060	
360 minute winter	2	Hydro-Brake®	1	2.8				82.4

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.78%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	21	13	6.665	0.194	3.1	0.2822	0.0000	FLOOD RISK
15 minute winter	20	13	6.664	0.224	3.1	0.3099	0.0000	SURCHARGED
15 minute winter	19	13	6.663	0.260	4.0	0.2940	0.0000	SURCHARGED
15 minute summer	18	1	6.382	0.000	3.4	0.0000	0.0000	OK
600 minute winter	17	585	6.480	0.445	3.8	9.2378	0.0000	SURCHARGED
600 minute winter	16	585	6.480	0.319	1.5	7.0550	0.0000	SURCHARGED
30 minute winter	15	25	6.480	0.311	17.0	7.3737	0.0000	SURCHARGED
600 minute winter	14	585	6.480	0.354	5.0	4.9852	0.0000	SURCHARGED
600 minute winter	13	585	6.480	0.432	6.6	4.5069	0.0000	SURCHARGED
30 minute winter	12	26	6.489	0.404	30.0	16.8411	0.0000	SURCHARGED
30 minute winter	11	25	6.509	0.303	17.8	8.0817	0.0000	SURCHARGED
30 minute winter	10	24	6.513	0.243	14.8	5.6442	0.0000	SURCHARGED
30 minute winter	9	24	6.513	0.201	5.9	0.3539	0.0000	OK
30 minute winter	8	24	6.513	0.271	10.9	0.4780	0.0000	SURCHARGED
30 minute winter	7	25	6.509	0.328	12.8	0.5452	0.0000	SURCHARGED
30 minute winter	6	26	6.488	0.421	33.6	1.5681	0.0000	SURCHARGED
600 minute winter	5	585	6.479	0.472	18.6	0.8348	0.0000	FLOOD RISK
600 minute winter	4	585	6.479	0.523	18.5	0.9239	0.0000	FLOOD RISK
600 minute winter	3	555	6.484	0.584	18.4	153.1412	0.0000	FLOOD RISK
600 minute winter	2	585	6.479	0.588	4.4	1.0388	0.0000	FLOOD RISK
15 minute summer	1	1	5.772	0.000	2.8	0.0000	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)
15 minute winter	21	8.000	19	2.1	0.343	0.160	0.2098	
15 minute winter	20	9.000	19	2.3	0.380	0.174	0.1140	
15 minute winter	19	Orifice	18	3.6				2.9
600 minute winter	17	7.000	5	3.7	0.149	0.123	0.3314	
600 minute winter	16	6.000	14	1.4	0.231	0.047	0.4209	
30 minute winter	15	5.000	14	8.3	0.359	0.280	0.5152	
600 minute winter	14	5.001	13	5.0	0.383	0.167	0.9251	
600 minute winter	13	5.002	5	6.3	0.289	0.212	0.4912	
30 minute winter	12	4.000	6	-13.9	-0.348	-0.465	0.2096	
30 minute winter	11	3.000	7	-7.0	0.350	-0.236	0.2945	
30 minute winter	10	2.000	8	-6.4	0.343	-0.214	0.3315	
30 minute winter	9	1.000	8	4.3	0.284	0.145	0.8066	
30 minute winter	8	1.001	7	7.8	0.488	0.263	0.7233	
30 minute winter	7	1.002	6	12.5	0.413	0.418	1.3585	
30 minute winter	6	1.003	5	23.5	0.591	0.789	0.7110	
600 minute winter	5	1.004	4	18.5	0.682	0.621	0.6087	
600 minute winter	4	1.005	3	18.4	1.004	0.618	0.6623	
600 minute winter	3	1.006	2	4.4	0.195	0.149	0.1060	
600 minute winter	2	Hydro-Brake®	1	2.8				103.9

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.78%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	21	13	6.813	0.342	4.4	0.4989	0.0000	FLOOD RISK
15 minute winter	20	13	6.812	0.372	4.4	0.5161	0.0000	FLOOD RISK
15 minute winter	19	13	6.811	0.408	5.3	0.4613	0.0000	FLOOD RISK
15 minute summer	18	1	6.382	0.000	4.4	0.0000	0.0000	OK
720 minute winter	17	705	6.683	0.648	4.6	31.3600	0.0000	FLOOD RISK
720 minute winter	16	705	6.683	0.522	3.1	20.5158	0.0000	FLOOD RISK
720 minute winter	15	705	6.683	0.514	3.2	21.4980	0.0000	FLOOD RISK
720 minute winter	14	705	6.683	0.557	5.9	10.4480	0.0000	FLOOD RISK
720 minute winter	13	705	6.683	0.635	7.1	8.1748	0.0000	FLOOD RISK
720 minute winter	12	705	6.683	0.598	5.8	47.4182	0.0000	FLOOD RISK
720 minute winter	11	705	6.683	0.477	2.9	15.9477	0.0000	FLOOD RISK
720 minute winter	10	705	6.683	0.413	2.4	11.3593	0.0000	FLOOD RISK
720 minute winter	9	705	6.683	0.371	0.8	0.6543	0.0000	FLOOD RISK
720 minute winter	8	705	6.683	0.441	2.7	0.7789	0.0000	FLOOD RISK
720 minute winter	7	705	6.683	0.502	4.7	0.8348	0.0000	FLOOD RISK
720 minute winter	6	705	6.683	0.616	10.0	2.2924	0.0000	FLOOD RISK
720 minute winter	5	705	6.683	0.676	20.1	1.1939	0.0000	FLOOD RISK
720 minute winter	4	690	6.682	0.726	20.0	1.2834	0.0000	FLOOD RISK
720 minute winter	3	690	6.686	0.786	19.9	153.1412	0.0000	FLOOD RISK
720 minute winter	2	705	6.681	0.790	3.7	1.3967	0.0000	FLOOD RISK
15 minute summer	1	1	5.772	0.000	2.8	0.0000	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)
15 minute winter	21	8.000	19	2.6	0.359	0.191	0.2098	
15 minute winter	20	9.000	19	2.8	0.395	0.207	0.1140	
15 minute winter	19	Orifice	18	4.6				4.0
720 minute winter	17	7.000	5	4.5	0.158	0.151	0.3314	
720 minute winter	16	6.000	14	1.6	0.225	0.053	0.4209	
720 minute winter	15	5.000	14	2.2	0.287	0.072	0.5152	
720 minute winter	14	5.001	13	5.0	0.386	0.169	0.9251	
720 minute winter	13	5.002	5	6.5	0.291	0.219	0.4912	
720 minute winter	12	4.000	6	-3.6	0.148	-0.119	0.2096	
720 minute winter	11	3.000	7	-1.4	0.218	-0.047	0.2945	
720 minute winter	10	2.000	8	-1.2	0.256	-0.039	0.3315	
720 minute winter	9	1.000	8	0.8	0.202	0.027	0.8312	
720 minute winter	8	1.001	7	2.7	0.370	0.090	0.7233	
720 minute winter	7	1.002	6	4.4	0.361	0.149	1.3585	
720 minute winter	6	1.003	5	9.6	0.423	0.321	0.7110	
720 minute winter	5	1.004	4	20.0	0.652	0.672	0.6087	
720 minute winter	4	1.005	3	19.9	1.023	0.669	0.6623	
720 minute winter	3	1.006	2	3.7	0.195	0.123	0.1060	
720 minute winter	2	Hydro-Brake®	1	2.8				131.4

Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 99.78%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	21	13	6.871	0.400	4.8	0.5965	0.0000	FLOOD RISK
15 minute winter	20	13	6.870	0.430	4.8	0.6070	0.0000	FLOOD RISK
15 minute winter	19	13	6.868	0.465	5.8	0.5263	0.0000	FLOOD RISK
15 minute summer	18	1	6.382	0.000	4.7	0.0000	0.0000	OK
720 minute winter	17	660	6.752	0.717	5.1	39.0131	0.0000	FLOOD RISK
720 minute winter	16	660	6.752	0.591	3.3	25.1580	0.0000	FLOOD RISK
720 minute winter	15	660	6.752	0.583	3.5	26.3953	0.0000	FLOOD RISK
720 minute winter	14	660	6.752	0.626	6.4	12.0903	0.0000	FLOOD RISK
720 minute winter	13	660	6.752	0.704	7.5	8.5465	0.0000	FLOOD RISK
720 minute winter	12	660	6.752	0.667	7.6	56.5980	0.0000	FLOOD RISK
720 minute winter	11	660	6.752	0.546	3.5	19.1427	0.0000	FLOOD RISK
720 minute winter	10	660	6.753	0.483	2.9	13.7322	0.0000	FLOOD RISK
720 minute winter	9	660	6.752	0.440	0.9	0.8043	0.0000	FLOOD RISK
720 minute winter	8	660	6.753	0.511	2.8	0.9343	0.0000	FLOOD RISK
720 minute winter	7	660	6.752	0.571	4.8	0.9807	0.0000	FLOOD RISK
720 minute winter	6	660	6.752	0.685	10.2	2.7091	0.0000	FLOOD RISK
720 minute winter	5	660	6.752	0.745	20.8	1.3161	0.0000	FLOOD RISK
720 minute winter	4	660	6.750	0.794	20.7	1.4030	4.1786	FLOOD
720 minute winter	3	675	6.750	0.850	20.6	153.1412	0.0000	FLOOD RISK
720 minute winter	2	705	6.749	0.858	4.4	1.5166	0.0000	FLOOD RISK
15 minute summer	1	1	5.772	0.000	2.8	0.0000	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)
15 minute winter	21	8.000	19	2.8	0.372	0.213	0.2098	
15 minute winter	20	9.000	19	2.9	0.411	0.220	0.1140	
15 minute winter	19	Orifice	18	5.0				4.5
720 minute winter	17	7.000	5	4.8	0.152	0.160	0.3314	
720 minute winter	16	6.000	14	1.7	0.225	0.057	0.4209	
720 minute winter	15	5.000	14	2.4	0.287	0.079	0.5152	
720 minute winter	14	5.001	13	5.3	0.384	0.180	0.9251	
720 minute winter	13	5.002	5	6.8	0.287	0.227	0.4912	
720 minute winter	12	4.000	6	-4.9	0.152	-0.165	0.2096	
720 minute winter	11	3.000	7	-1.8	0.214	-0.061	0.2945	
720 minute winter	10	2.000	8	-1.6	0.252	-0.053	0.3315	
720 minute winter	9	1.000	8	0.8	0.198	0.027	0.8312	
720 minute winter	8	1.001	7	2.8	0.370	0.093	0.7233	
720 minute winter	7	1.002	6	4.4	0.360	0.149	1.3585	
720 minute winter	6	1.003	5	9.8	0.426	0.328	0.7110	
720 minute winter	5	1.004	4	20.7	0.653	0.695	0.6087	
720 minute winter	4	1.005	3	20.6	1.043	0.692	0.6623	
720 minute winter	3	1.006	2	4.4	0.181	0.146	0.1060	
720 minute winter	2	Hydro-Brake®	1	2.8				135.8



Notes:

1. Do not scale from this drawing.
2. All dimensions must be checked on site prior to commencement of work.
3. Where applicable this drawing is to be read in conjunction with other consultants drawings.
4. This drawing is the copyright of Impact Geotechnical Ltd.

Drawing Title:

Hole Location Plan

Site Name:

Paynters Croft GWM

Project Reference:

P19.160

Revision: 0

Drawn by: RM
Scale: Not to Scale



IMPACT
GEOTECHNICAL

Percussion Drilling Log

Project Name: Paynters Croft		Client: Mr J Napthine		Date: 29/11/2019	
Location: Yapton, West Sussex		Contractor: Impact Geotechnical Ltd			
Project No. : P19.160		Crew Name: SG		Drilling Equipment: Archway Dart	
Borehole Number WS1	Hole Type WLS	Level	Logged By RM	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20						MADE GROUND: Grass over brown silty sandy Clay. Sand is fine to coarse. Rare subangular to subrounded fine to coarse sized flint (Topsoil). (Soft to firm) brown mottled orange brown silty sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse sized flint (RIVER TERRACE DEPOSITS).	1
		0.50	D						
		1.00	SPT	N=8 (1,1/2,2,2,2)					
		1.50	D						
		2.00	SPT	N=10 (1,2/2,3,2,3)				Becoming firm below 2.00mbgl.	2
		2.50	D					Below 2.30mbgl becoming very silty/fine sandy with gravel of flint and chalk.	
		3.00	SPT	N=13 (1,2/2,3,3,5)					3
		3.50	D						4
		4.50	D					4.40-4.60mbgl: band of very fine sandy Silt.	
		5.00						End of Borehole at 5.000m	5
									6
									7
									8
									9
									10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks
Hand dug starter pit dug to 1.00mbgl. Groundwater encountered at 3.00mbgl and noted to rise to 2.80mbgl and 4.50mbgl noted to rise to 1.05mbgl. 35mm diameter standpipe installed to 4.75mbgl.



Percussion Drilling Log

Project Name: Paynters Croft		Client: Mr J Napthine		Date: 29/11/2011	
Location: Yapton, West Sussex		Contractor: Impact Geotechnical Ltd			
Project No. : P19.160		Crew Name: SG		Drilling Equipment: Archway Dart	
Borehole Number WS2	Hole Type WLS	Level	Logged By RM	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.50	D					Grass over brown very silty sandy CLAY. Sand is fine, Rare subangular to subrounded fine to coarse sized gravel of flint (RIVER TERRACE DEPOSITS).	1
		1.00	SPT	N=5 (1,1/1,1,1,2)					
		1.50	D						
		2.00	SPT	N=0 (0,0/0,0,0,0)	2.00			(Very loose) orange brown very silty very clayey SAND. Sand is fine to medium. Rare subangular to subrounded fine to medium gravel of flint (RIVER TERRACE DEPOSITS). <i>2.00mbgl: band of silty fine SAND.</i>	2
		2.50	D		2.80				
		3.00	SPT	N=16 (3,3/4,4,4,4)				White sandy gravelly SILT of CHALK. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse sized weak chalk (LEWES NODULAR CHALK FORMATION).	3
		3.50	D						
		4.00	SPT	N=21 (3,4/5,5,5,6)					
		4.50	D						
					5.00			End of Borehole at 5.000m	5
									6
									7
									8
									9
									10

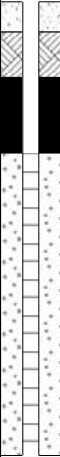
Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks
Hand dug starter pit dug to 1.00mbgl. Groundwater encountered at 1.00mbgl and noted to rise to 1.20mbgl. 35mm diameter standpipe installed to 4.80mbgl.



Percussion Drilling Log

Project Name: Paynters Croft		Client: Mr J Napthine		Date: 29/11/2019	
Location: Yapton, West Sussex		Contractor: Impact Geotechnical Ltd			
Project No. : P19.160		Crew Name: SG		Drilling Equipment: Archway Dart	
Borehole Number WS3	Hole Type WLS	Level	Logged By RM	Scale 1:50	Page Number Sheet 1 of 1

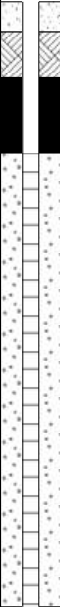
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.50	D		0.30 0.40			MADE GROUND: Grass over brown silty sandy Clay. Sand is fine to coarse. Rare subangular to subrounded fine to coarse sized flint (Topsoil).	
		1.00	SPT	N=8 (1,1/1,1,2,4)				Brown silty sandy Gravel. Sand is fine to medium. Gravel is rounded medium to coarse sized flint.	1
		1.50	D					(Soft to firm) brown silty slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse sized flint (RIVER TERRACE DEPOSITS).	
		2.00	SPT	N=3 (0,1/0,1,1,1)	2.00			1.00-1.10mbgl: fine to medium Sand band (wet).	
		2.50	D					Below 1.60mbgl locally very sandy.	2
		3.00	SPT	N=11 (2,3/3,3,2,3)				Orange brown clayey very silty slightly gravelly SAND. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse sized flint and chalk (RIVER TERRACE DEPOSITS).	3
		3.50	D					Pale grey mottled white sandy gravelly CLAY. Sand is fine to medium. Gravel is subangular to subrounded fine to coarser sized flint and chalk (RIVER TERRACE DEPOSITS).	4
					3.80 4.00			End of Borehole at 4.000m	5
									6
									7
									8
									9
									10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks
Hand dug starter pit dug to 1.00mbgl. Groundwater encountered at 1.00mbgl. Borehole collapsed back from 4.00m to 3.00mbgl. 35mm diameter standpipe installed to 3.00mbgl.

Percussion Drilling Log

Project Name: Paynters Croft		Client: Mr J Napthine		Date: 18/12/2019	
Location: Yapton, West Sussex		Contractor: Impact Geotechnical Ltd			
Project No. : P19.160		Crew Name: SG		Drilling Equipment: Archway Dart	
Borehole Number WS4	Hole Type WLS	Level	Logged By RM	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
								Grass over brown very silty sandy CLAY. Sand is fine, Rare subangular to subrounded fine to coarse sized gravel of flint (RIVER TERRACE DEPOSITS).	1
					2.00			(Very loose) pale brown very silty very clayey SAND. Sand is fine to medium. Rare subangular to subrounded fine to medium gravel of flint (RIVER TERRACE DEPOSITS).	2
					2.50			Pale brown mottled white clayey silty sandy GRAVEL. Sand is fine to medium. Gravel is angular to subangular fine to coarser sized flint and chalk (RIVER TERRACE DEPOSITS).	3
					3.10			White sandy gravelly SILT of CHALK. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse sized weak chalk (LEWES NODULAR CHALK FORMATION).	4
					4.00			End of Borehole at 4.000m	4
									5
									6
									7
									8
									9
									10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks
Hand dug starter pit dug to 1.00mbgl. Groundwater encountered at 1.00mbgl and noted to rise to 0.82mbgl. 35mm diameter standpipe installed to 4.00mbgl.



Percussion Drilling Log

Project Name: Paynters Croft		Client: Mr J Napthine		Date: 18/12/2019	
Location: Yapton, West Sussex		Contractor: Impact Geotechnical Ltd			
Project No. : P19.160		Crew Name: SG		Drilling Equipment: Archway Dart	
Borehole Number WS5	Hole Type WLS	Level	Logged By RM	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
								Grass over brown very silty sandy CLAY. Sand is fine, Rare subangular to subrounded fine to coarse sized gravel of flint (RIVER TERRACE DEPOSITS).	1
					2.00			(Very loose) orange brown very silty very clayey SAND. Sand is fine to medium. Rare subangular to subrounded fine to medium gravel of flint (RIVER TERRACE DEPOSITS).	2
					3.50				3
					4.00			Pale grey mottled orange brown clayey very silty SAND. Sand is fine to medium. Rare subangular to subrounded fine to medium gravel of flint (RIVER TERRACE DEPOSITS). End of Borehole at 4.000m	4
									5
									6
									7
									8
									9
									10

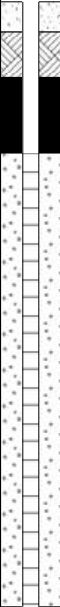
Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks
Hand dug starter pit dug to 1.00mbgl. Groundwater encountered at 1.00mbgl and noted to rise to 0.84mbgl. 35mm diameter standpipe installed to 4.00mbgl.



Percussion Drilling Log

Project Name: Paynters Croft		Client: Mr J Napthine		Date: 18/12/2019	
Location: Yapton, West Sussex		Contractor: Impact Geotechnical Ltd			
Project No. : P19.160		Crew Name: SG		Drilling Equipment: Archwat Dart	
Borehole Number WS6	Hole Type WLS	Level	Logged By RM	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
								Grass over brown very silty sandy CLAY. Sand is fine, Rare subangular to subrounded fine to coarse sized gravel of flint (RIVER TERRACE DEPOSITS).	1
					2.00			(Very loose) orange brown very silty very clayey SAND. Sand is fine to medium. Rare subangular to subrounded fine to medium gravel of flint (RIVER TERRACE DEPOSITS).	2
					3.80				3
					4.00			White sandy gravelly SILT of CHALK. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse sized weak chalk (LEWES NODULAR CHALK FORMATION). End of Borehole at 4.000m	4
									5
									6
									7
									8
									9
									10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks
 Hand dug starter pit dug to 1.00mbgl. Groundwater encountered at 1.00mbgl and noted to rise to 0.86mbgl. 35mm diameter standpipe installed to 4.00mbgl.

Measurement equates to depth below ground level at location of monitoring well.

2019.11.29 2019.12.18 2020.01.03 2020.01.17 2020.01.31 2020.02.14 2020.02.28 2020.03.13 2020.03.27

Depth in meters

Date of measurement

MW 1 MW 2 MW 3 MW 4 MW 5 MW 6

Date of measurement	MW 1	MW 2	MW 3	MW 4	MW 5	MW 6
2019.11.29	1.05	1.20	1.12	1.08	1.12	1.05
2019.12.18	0.98	1.73	0.68	0.82	0.85	0.88
2020.01.03	1.12	1.78	0.88	0.98	1.03	1.12
2020.01.17	1.03	1.76	0.88	0.95	1.00	1.00
2020.01.31	1.25	1.83	1.08	1.08	1.15	1.15
2020.02.14	0.50	1.55	0.28	0.45	0.28	0.55