SuDS & Foul Drainage Assessment Including FRA

Twineham Court Farmhouse, Bob Lane

Twineham RH17 5NH

Client

Telbridge Properties Limited
Hornbrook House
Brighton Road
Horsham
RH13 6QA
Ref: 12391B
Date: July 2024

Consulting Engineers

GTA Civils & Transport Ltd
Maple House
192 – 198 London Road
Burgess Hill
West Sussex
RH15 9RD
Tel: 01444 871444

Index

Schedule of Appendices

Issue	Issue date	Compiled	Checked
Preliminary Issue	19 April 2024	FVV	JP
First Issue	22 July 2024	FVV	JP
Second Issue	02 December 2024	JP	FVV / MR

1 Introduction

1.1 This Drainage Assessment has been prepared for Telbridge Properties Limited in relation to the proposed development at Twineham Court Farmhouse, Bob Lane, Twineham RH17 5NH. No responsibility is accepted to any third party for all or part of this study in connection with this or any other development.

1.2 This assessment, along with the accompanying Site Drainage Strategy drawing is to support a planning application to Mid Sussex District Council for the development of a new Events Venue at the above site.

1.3 No responsibility is accepted to any third party for all or part of this study in connection with this or any other development.

1.4 The second version of this Statement has been prepared following a request by the LPA to include 'FRA' in the title.

2 Existing Site

2.1 The application site, administered by Mid Sussex District Council (MSDC), is located north of Bob Lane, equidistant between the village centres of Twineham and Wineham. The site comprises Twineham Court Farmhouse with a complex of agricultural buildings to the south and east. Access is via a drive to Bob Lane to the south. A site location map and aerial photo are shown in Appendix A.

2.2 Hydrology: the east branch of the River Adur rises at Ditchling Common and passes the site approximately 700m to the southeast. Approximately 400m to the north of the Farmhouse, an unnamed watercourse flows west to east, joining the eastern Adur near Twineham. There is a ditch on the eastern boundary of the site. This ditch starts within the site at the high point midway between the north and south boundary. The northern section flows northwards, past the existing power station, and into the unnamed watercourse (as surveyed). The southern section flows southward towards Bob Lane.

2.3 Topography: a topographical survey is shown in Appendix B. The levels fall gently from the high point in the west of the site, at around 31.15mAOD, towards both the north and the south boundary, and towards the ditch on the east boundary. The low point at the south boundary is around 25.20mAOD, and the low point at the north boundary is around 26.82mAOD.

2.4 Geology: online maps by BGS show the Farmhouse is located on a thin west-east band of Weald Clay Formation (clay-ironstone), while the rest of the site is situated on Weald Clay Formation (mudstone). There are no superficial deposits overlying either of these.

2.5 Soakage Testing: A percolation test was carried out based on BS 6297:2007 to ascertain the suitability of drainage fields on the site. The test was conducted in the north of the site and showed that the ground was heavily saturated and therefore not suitable for traditional drainage field solutions. Refer to Appendix C.

2.6 Public sewers: There are no public sewers nearby.

2.7 Existing drainage: the existing private drainage serving the site is unknown. In the absence of information, it is assumed that the existing foul drains from the farmhouse are connected to a historical cesspit on site. The existing surface water drainage is routed to an onsite pond with no flow controls in place.

2.8 The flood risk profile of this site is deemed to be 'low' – having examined the EA's online fluvial, pluvial and reservoir flood maps.

3 Development Proposals and Drainage Strategy

3.1 The proposal is for the construction of new events facilities at this site, comprising a new car park, amended access, new estate management facilities, and the event venue itself. Please refer to previous planning applications DM/23/2385 and DM/23/2386 for details covering the ancillary accommodation and annex.

Surface Water Drainage

3.2 The surface water runoff from the new facilities will be directed to two new attenuation ponds in the south of the site, working in cascade. These ponds have been designed to accommodate sufficient storage volume to attenuate all events up to and including the 1 in 100 year +45% climate change event.

3.3 Additionally, the proposed car park shall be constructed with permeable surfacing, with 300mm of granular subbase with a 0.3 void ratio, and outfall to the proposed attenuation ponds. The drainage strategy is included in Appendix D.

3.4 Surface water runoff will be attenuated to greenfield QBAR rate of 1.96 l/s. This is based on a total catchment area of 0.347ha, and greenfield QBAR of 5.64 l/s/ha. Calculations are included in Appendix E. The attenuated runoff will discharge to the existing ditch via a new formal outfall.

3.5 Exceedance flow will follow the existing topography of the site and flow in a generally southeastern direction, towards the existing ditches and away from the proposed buildings. This is shown on the drainage drawing in Appendix D.

3.6 Water Quality: The pollution hazard level for the proposed site have been assessed as Low, based on a non-residential use with infrequent change (i.e. <300 traffic movements/day). The corresponding pollution indices are 0.5, 0.4 and 0.4 (as set out in Table 26.2 of CIRIA SuDS Manual C753.) Table 26.3 sets out the mitigation indices for discharges to surface water. The corresponding indices for permeable pavements are 0.7, 0.6 and 0.7; and for attenuation ponds are 0.7, 0.7, and 0.5. Thus, it is considered that the proposed drainage strategy will have no adverse impacts on the water quality of the receiving ditches.

3.7 Maintenance responsibilities for the proposed surface water network will remain the responsibility of the landowner.

Foul Water Drainage

3.8 As discussed in Section 2, the existing ground at the site is heavily saturated with very low infiltration rate and therefore a drainage field would not be a suitable solution to manage the foul drainage from the site. For this reason, it is proposed to treat the foul effluent on site, with a new formal outfall to the existing ditch flowing northward. The drainage strategy is included in Appendix D.

3.9 To ensure an acceptable quality of effluent for release to the ditch, two stages of treatment will be provided upstream of the outfall. The first stage will be a packaged treatment plant. This shall be designed by a specialist to provide a sufficient level of treatment to cater for the expected flows. A sampling chamber will be located downstream of the packaged treatment plant so that its functionality can be monitored.

3.10 The treated effluent will then be directed through a raised drainage mound. This will act as a secondary stage of treatment, to ensure any remaining contaminants are adequately treated. The drainage mound shall be detailed to BR478 standards.

3.11 Maintenance responsibilities for the proposed foul network will remain the responsibility of the landowner.

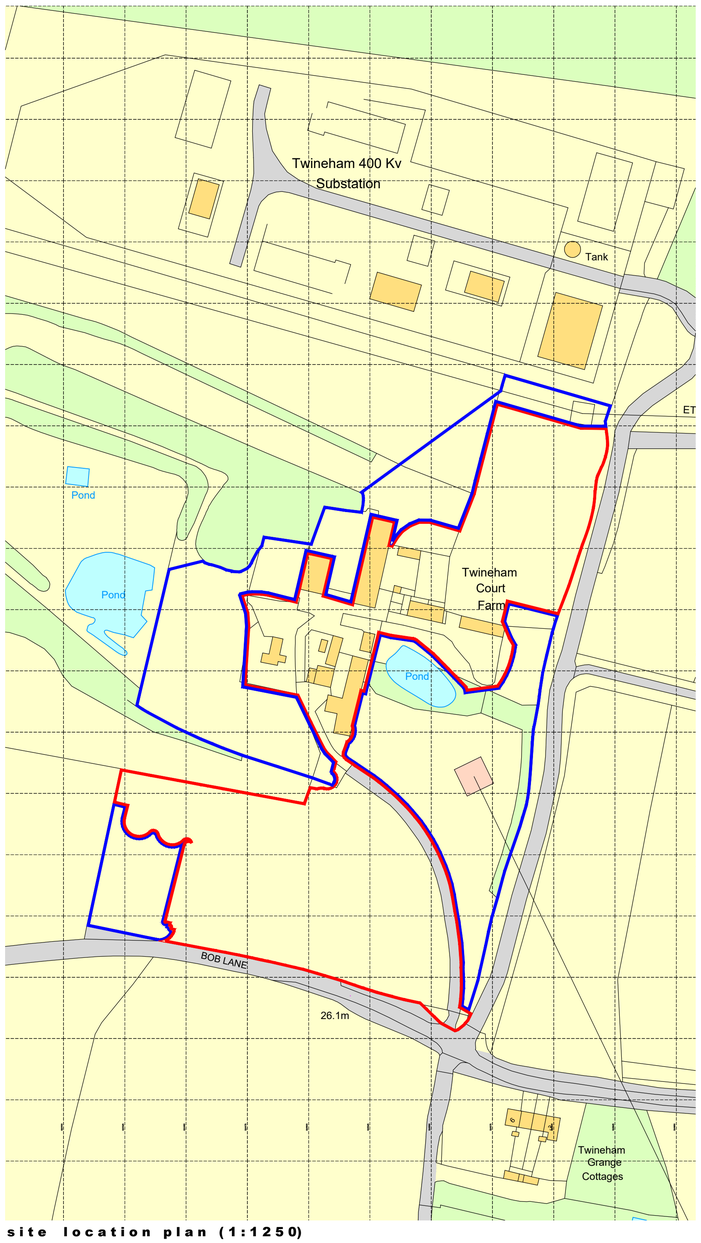
3.12 It is contended that this development's SuDS and foul drainage design is fully compliant with the PPG/NPPF. This proposal will not increase the flood risk of this or neighbouring sites.

- End of Statement -

Appendix A

Site Location Map and Aerial Photo


Site Location
Bob Ln
Bob Ln
Bob



site location plan (1:1250)

0m 10m 20m 30m 40m 50m

block plan (1:500)

0m 5m 10m 20m 30m 40m 50m

proposed barns shown hatched

notes + revisions

ARCHITECTURE
26 Sutton Park Road I Seaford
East Sussex I BN25 1QU
01323 404880
mail@g3architecture.co.uk
www.g3architecture.co.uk

client + project Telbridge Properties Twineham Court Farm Bob Lane, Twineham	title Location + Block Plans	scale As Noted - A1	drwg ref k:\drawings\2024\2427\Twineham Court Farm
		date 15.02.2024	number 2427.LP01
			status OS

Appendix B

Topographical Survey

TOPOGRAPHICAL SURVEY
SE SURVEYING
1:500 AT A1

Appendix C

Soakage testing

Percolation Test

As instructed we have started the process of the percolation test at Twineham Court Farm for our proposed foul waste drainage field. The first test hole was dug in the proposed area of the water treatment plant and drainage field to the north of the site. As per the standard percolation trial test for foul waste effluent drainage fields we dug the hole to 1m deep and 900mm long x 500mm wide using a digger.

We filled the hole with water to a level of 730mm as the first of the potentially 3 fill/empty procedures to saturate the ground around the hole and waited for this to empty.

This first fill did not fall in its level of 730mm at all on day one.

We then went back 10 days later to find the hole had emptied by ¾ at 610mm deep.

Therefore it can be safely assumed that a conventional drainage field would be highly ineffective and cause the system to fail almost immediately.

Appendix D

Proposed Site Layout and Drainage Strategy

G3 ARCHITECTURE
26 Sutton Park Road I Seaford
East Sussex I BN25 1QU
01323 404880
mail@g3architecture.co.uk
www.g3architecture.co.uk

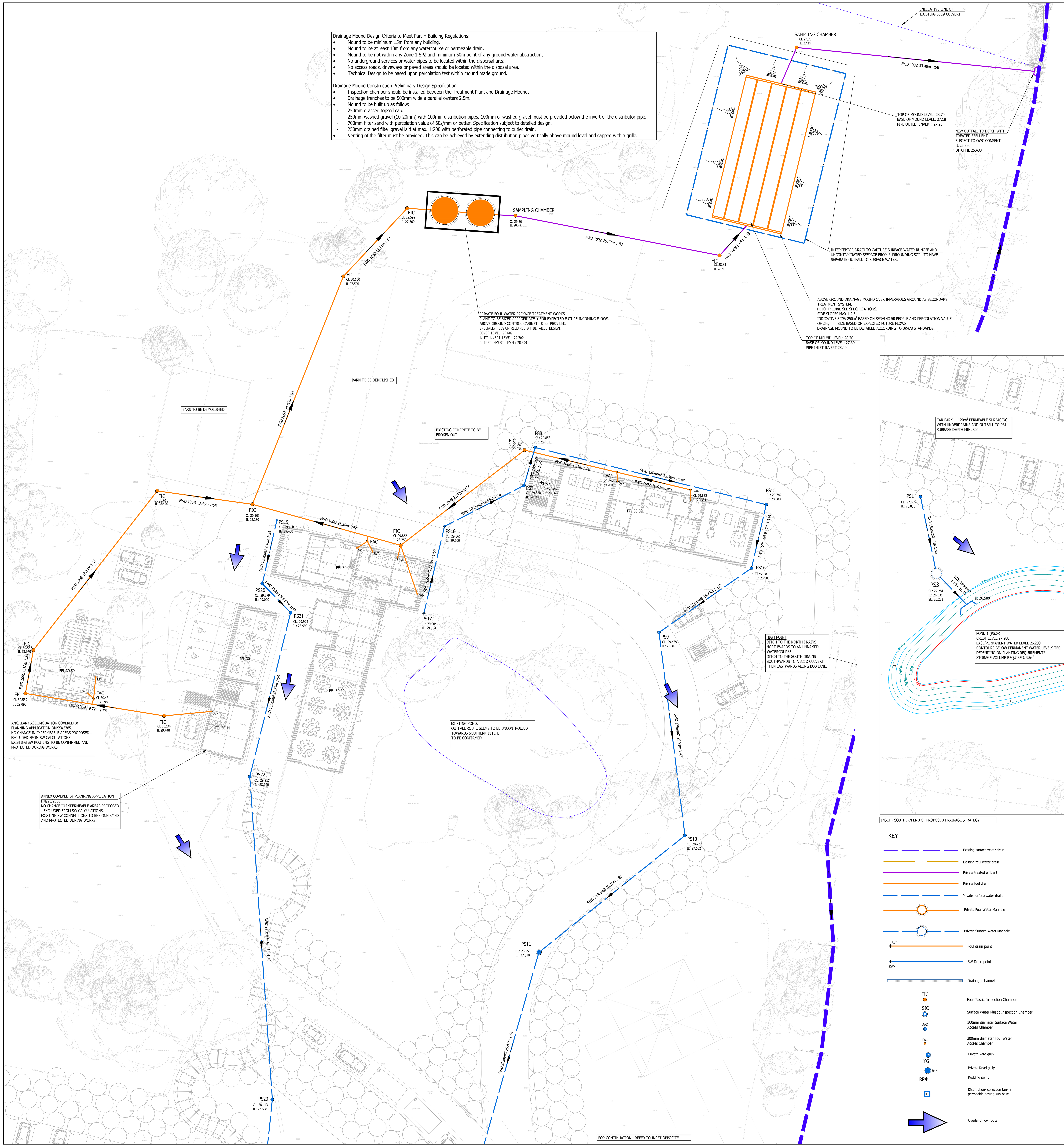
scale 1 : 500 @ A1
date 15.02.2024
status PLANNING
drwg ref x:drawings/2024/2427/Twineham Court Farm
number 2427.PL01

title
Proposed Site Layout/Block Plan

client + project
Telbridge Properties
Twineham Court Farm
Bob Lane, Twineham

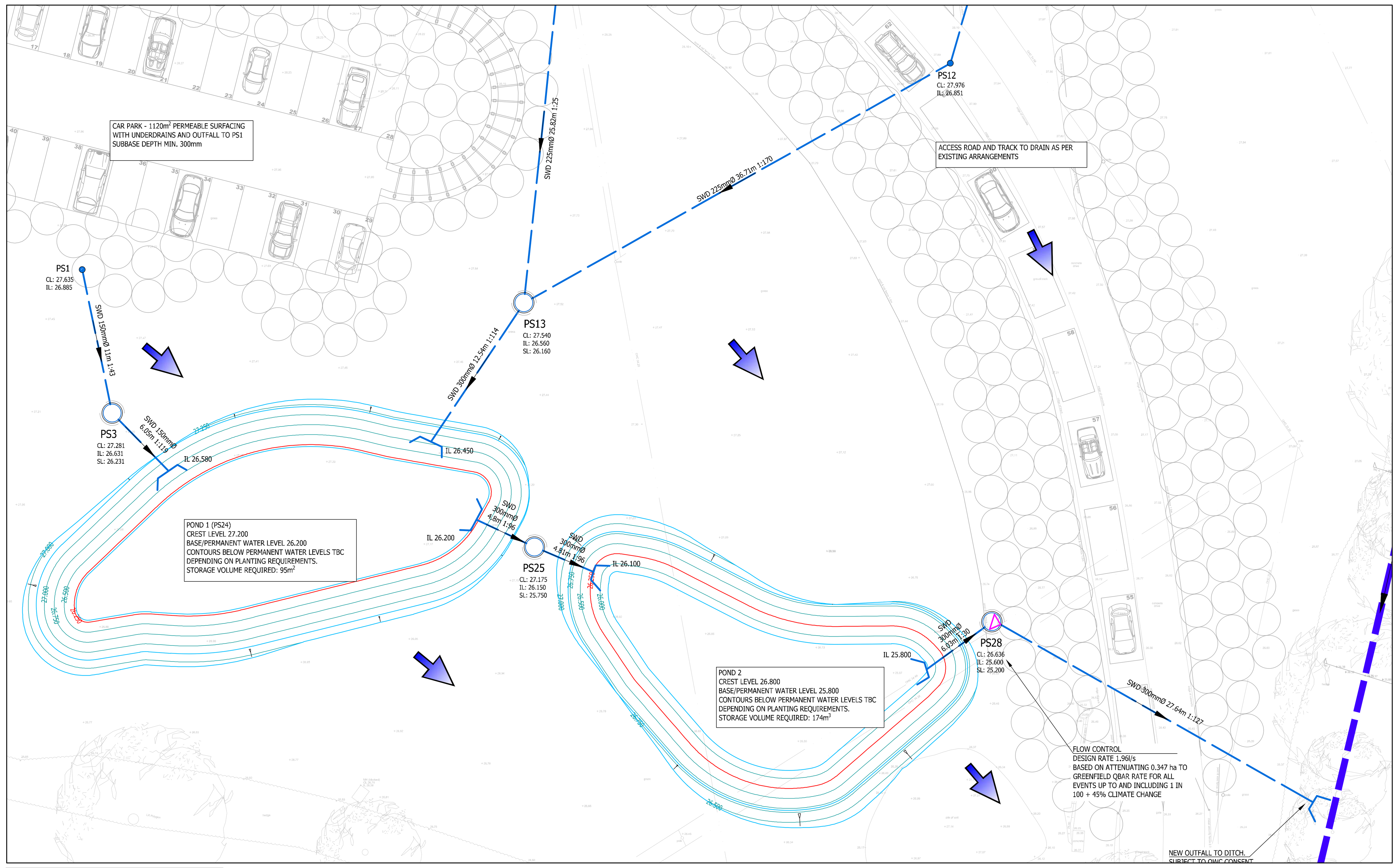
KEY:
1 3D VIEWPOINT (REFER TO DRAWINGS 2427.PL12 - 2427.PL23)

notes + revisions



Drainage Mound Design Criteria to Meet Part H Building Regulations:
- Mound to be minimum 15m from any building.
- Mound to be at least 10m from any watercourse or permeable drain.
- Mound to be not within any Zone 1 SPZ and minimum 50m point of any ground water abstraction.
- No underground services or water pipes to be located within the dispersal area.
- No access roads, driveways or paved areas should be located within the disposal area.
- Technical Design to be based upon percolation test within mound made ground.

Drainage Mound Construction Preliminary Design Specification
- Inspection chamber should be installed between the Treatment Plant and Drainage Mound.
- Drainage trenches to be 500mm wide a parallel centers 2.5m.
- Mound to be built up as follow:
  - 250mm grassed topsoil cap.
  - 250mm washed gravel (10-20mm) with 100mm distribution pipes. 100mm of washed gravel must be provided below the invert of the distributor pipe.
  - 700mm filter sand with percolation value of 60s/mm or better. Specification subject to detailed design.
  - 250mm drained filter gravel laid at max. 1:200 with perforated pipe connecting to outlet drain.
- Venting of the filter must be provided. This can be achieved by extending distribution pipes vertically above mound level and capped with a grille.



INSET - SOUTHERN END OF PROPOSED DRAINAGE STRATEGY

DESIGN NOTES

1. FOUL DESIGN SHOWN IS SUBJECT TO DETAILED AND SPECIALIST DESIGNS.

2. SURFACE WATER STORAGE BASED ON 1 IN 100+45% CLIMATE CHANGE EVENT.

3. DRAIN POINTS AND LOCATIONS TO BE CONFIRMED BY ARCHITECT.

4. CONTRACTOR TO ESTABLISH LOCATIONS OF ALL EXISTING SERVICES PRIOR TO COMMENCING.

5. EXISTING TREES TO BE PROTECTED WHERE EXCAVATIONS RUN CLOSE.

6. PERMITS REQUIRED FROM THE ENVIRONMENT AGENCY FOR EFFLUENT DISCHARGE. ORDINARY WATERCOURSE CONSENT REQUIRED FOR NEW OUTFALLS TO DITCH.

7. THIS DRAWING IS FOR PRELIMINARY DESIGN ONLY. NOT FOR CONSTRUCTION.

DESIGN NOTES

All pipes which pass through root protection areas must be hand dug whilst under the supervision of an arboriculturalist.

ABBREVIATIONS

D307.0	DETAIL NUMBER - SEE DRAINAGE DETAIL SHEET
FD	FOUL DRAIN
SWD	SURFACE WATER DRAIN
FWS	ADOPTABLE FOUL WATER SEWER
SWS	ADOPTABLE SURFACE WATER SEWER
MH	MANHOLE
IC	INSPECTION CHAMBER
SA	SOAKAWAY
FIC	450mm DIA. FOUL INSPECTION CHAMBER - D202.6
SIC	450mm DIA. SURFACE WATER INSPECTION CHAMBER - D202.6
FAC	300mm DIA. FOUL ACCESS CHAMBER - D202.18
SAC	300mm DIA. SURFACE WATER ACCESS CHAMBER - D202.18
CI	CAST IRON
VC	VITRIFIED CLAY
CONC	CONCRETE
PVC-U	POLYVINYL CHLORIDE - UNPLASTICISED
G	SMALL GULLY - D209.0
YG	YARD GULLY - D209.2
RG	ROAD GULLY - D208.1
CPG	CAR PARK GULLY - D208.2
DP	BELOW GROUND DRAIN POINT
SVP	SOIL VENT PIPE DROP
SS	STUB STACK OR DIRECT DRAIN CONNECTION
RP	EXTERNAL RODDING POINT - D213.1
DT	SURFACE WATER DISTRIBUTION TANK
FFL	FINISHED FLOOR LEVEL
SSL	STRUCTURAL SLAB LEVEL
GL	GROUND LEVEL
CL	COVER LEVEL
IL	INVERT LEVEL
SL	SUMP LEVEL
BL	BASE LEVEL
HL	HIGH LEVEL
BD	BACKDROP
CBS	CONCRETE BED & SURROUND
CLASS S	GRANULAR BED & SURROUND
CLASS B	GRANULAR BED

SPECIFICATION NOTES

All drainage shall be constructed and commissioned in accordance with BS EN 295 & BS EN752, Building Regulations Doc. H and any particular requirements of the Building Control Officer.

Drainage pipelines shall be in PVC-u below ground as Marley or similar approved, or vitrified clay.
All sewer pipelines to be VC only.

This drawing shall be read in conjunction with all other relevant drainage drawings, architectural drawings and structural drawings.

For manhole details, gully details, bedding etc, refer to gta detail sheets.

All foul water drain runs shall have a fall of 1:40 or steeper, unless noted otherwise.

All cement used for concrete drainage installations shall be sulphate resistant to class 3 of BRE Digest 363. (Grade ST5)

The use of short radius or 90º bends for changes in direction is not permitted, only long or medium radius 45º bends shall be used. All junctions shall be 45º.

All drains shall have granular bed and surround as class `S` bedding, unless noted otherwise.

All drainage works shall commence from the downstream end first unless agreed otherwise. Outfall level to be checked by contractor prior to any works commencing and any discrepancy identified to engineer prior to laying and drainage.

GENERAL NOTES

1. The location, size, depth and identification of existing services that may be shown or referred to on this drawing have been assessed from non intrusive observations , record drawings or the like. The contractor shall safely carry out intrusive investigations, trial holes or soundings prior to commencing work to satisfy himself that it is safe to proceed and that the assessments are accurate. any discrepancies shall be notified to gta prior to works commencing.

2. Tender or billing drawings shall not be used for construction or the ordering of materials.

3. Do not scale. All dimensions and levels to be site confirmed.

4. This drawing shall be read in conjunction with all relevant architects, consultants drawings and specifications, together with H&S plan requirements.

5. Copyright : This drawing must not be copied, amended nor reproduced without the prior written agreement of gta.

6. All drawings specifications and recommendations made by gta are subject to Local Authority and other relevant Statutory Authorities approval. Any works or services made abortive due to the client proceeding prior to these approvals is considered wholly at the Clients risk. gta hold no responsibility for resulting abortive works or costs.

7. If viewing this drawing as an Autocad file (.dwg) in digital format then it is done so with this Disclaimer due to the fact that it can be altered and manipulated following its issue by GTA Civils & Transport and therefore, any alteration or modification of DWG data files provided by GTA Civils & Transport, by you or a third party, without GTA Civils and Transport's express written approval, is done so entirely at your own risk. Modification includes (but is not limited to) turning layers on and off, unfreezing layers and reloading, turning on and off print functions and unloading x-refs.

8. Your attention is also drawn to the fact that the information contained within this file may be subject to alteration at any time, pending technical approval from an approving authority or at the client's instruction. It is therefore strongly recommended that multiple and regular cross checks are made against the current contract drawings.
It is your responsibility to ensure that the correct issue or revision of the DWG data file is being used and requests for updated information made accordingly.

9. Should any apparent discrepancies between the data contained within the DWG file and the current contract drawings become evident, it must be reported back to GTA Civils & Transport as soon as reasonably practicable. Precedence should be given to the current contract drawings (PDF) unless advised otherwise.

KEY

- Existing surface water drain
- Existing foul water drain
- Private treated effluent
- Private foul drain
- Private surface water drain
- Private Foul Water Manhole
- Private Surface Water Manhole
- SVP — Foul drain point
- RWP — SW Drain point
- Drainage channel
- FIC — Foul Plastic Inspection Chamber
- SIC — Surface Water Plastic Inspection Chamber
- SAC — 300mm diameter Surface Water Access Chamber
- FAC — 300mm diameter Foul Water Access Chamber
- YG — Private Yard gully
- RG — Private Road gully
- RP — Rodding point
- DT — Distribution/ collection tank in permeable paving sub-base
- Overland flow route

Rev	Amendments	Date	Dsn	Chk
P2	COORDINATED WITH TREES	23.04.24	FVV	MR
P1	FIRST ISSUE	19.04.24	FVV	MR

Status: PRELIMINARY

Client: TELBRIDGE PROPERTIES

Architect:

Project: TWINEHAM
TWINEHAM COURT FARM

Title: EVENT VENUE
DRAINAGE STRATEGY

Date: APRIL 2024	Scale @ A0: 1:200
Clients Ref.	Project Ref. 12391

gta Civil & T an p
Maple House, 192-198 London Road,
Burgess Hill, West Sussex, RH15 9RD
Tel.01444 871444 Web: www.gtacivils.co.uk

Drawing Number: 12391-1601 Rev.: P2

Appendix E

Drainage Calculations

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Florence Van Vaerenbergh
Site name:	Twineham Court Farm
Site location:	Bob Lane

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:	50.97308° N
Longitude:	0.22858° W
Reference:	4094952569
Date:	Apr 12 2024 15:12

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 1

Methodology

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

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	799	799
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):	5.64	5.64
1 in 1 year (l/s):	4.79	4.79
1 in 30 years (l/s):	12.96	12.96
1 in 100 year (l/s):	17.98	17.98
1 in 200 years (l/s):	21.08	21.08

Design Settings

Rainfall Methodology	FEH-22	Maximum Time of Concentration (mins)	30.00	Preferred Cover Depth (m)	1.200
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0	Include Intermediate Ground	✓
Additional Flow (%)	45	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	✓
CV	0.750	Connection Type	Level Soffits		
Time of Entry (mins)	5.00	Minimum Backdrop Height (m)	1.000		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Depth (m)
PS17	0.001	5.00	29.804	Manhole	0.500
PS18			29.849	Manhole	0.809
PS7	0.017	5.00	29.860	Manhole	0.500
PS8	0.017	5.00	29.844	Manhole	1.050
PS15	0.017	5.00	29.796	Manhole	0.500
PS16	0.017	5.00	29.820	Manhole	1.050
PS9	0.017	5.00	29.509	Manhole	1.125
PS10	0.017	5.00	28.757	Manhole	1.125
PS11			28.550	Manhole	1.240
PS12			27.976	Manhole	1.125
PS19	0.029	5.00	29.900	Manhole	0.500
PS20	0.029	5.00	29.879	Manhole	0.789
PS21	0.029	5.00	29.923	Manhole	0.933
PS22	0.029	5.00	29.911	Manhole	1.171
PS23			28.413	Manhole	0.725
PS13			27.540	Manhole	0.980
PS14			27.200	Junction	0.750
PS1	0.128	5.00	27.635	Junction	0.750
PS3			27.281	Manhole	0.650
PS4			27.200	Junction	0.620
PS24			27.200	Manhole	1.000
PS25			27.175	Manhole	1.025
PS26			26.800	Junction	0.700
PS27			26.800	Manhole	1.000

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Depth (m)
PS28			26.636	Manhole	1.036
PS29			26.370	Junction	0.970

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)
1.000	PS17	PS18	7.908	0.600	29.304	29.040	0.264	30.0	100
1.001	PS18	PS8	10.390	0.600	29.040	28.844	0.196	53.0	100
2.000	PS7	PS8	8.263	0.600	29.360	28.844	0.516	16.0	100
1.002	PS8	PS9	24.489	0.600	28.794	28.459	0.335	73.1	150
3.000	PS15	PS16	8.774	0.600	29.296	28.820	0.476	18.4	100
3.001	PS16	PS9	12.568	0.600	28.770	28.459	0.311	40.4	150
1.003	PS9	PS10	24.450	0.600	28.384	27.632	0.752	32.5	225
1.004	PS10	PS11	27.200	0.600	27.632	27.310	0.322	84.5	225
1.005	PS11	PS12	29.465	0.600	27.310	26.851	0.459	64.2	225
1.006	PS12	PS13	36.709	0.600	26.851	26.635	0.216	169.9	225
4.000	PS19	PS20	9.155	0.600	29.400	29.140	0.260	35.2	100

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	Σ Area (ha)
1.000	1.415	11.1	0.2	0.001
1.001	1.060	8.3	0.2	0.001
2.000	1.940	15.2	3.3	0.017
1.002	1.177	20.8	6.9	0.035
3.000	1.807	14.2	3.3	0.017
3.001	1.588	28.1	6.7	0.034
1.003	2.302	91.5	16.9	0.086
1.004	1.423	56.6	20.2	0.103
1.005	1.635	65.0	20.2	0.103
1.006	1.000	39.8	20.2	0.103
4.000	1.304	10.2	5.7	0.029

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)
4.001	PS20	PS21	5.670	0.600	29.090	28.990	0.100	56.7	150
4.002	PS21	PS22	23.732	0.600	28.990	28.740	0.250	94.9	150
4.003	PS22	PS23	45.412	0.600	28.740	27.688	1.052	43.2	225
4.004	PS23	PS13	25.820	0.600	27.688	26.635	1.053	24.5	225
1.007	PS13	PS14	12.536	0.600	26.560	26.450	0.110	114.0	300
1.008	PS14	PS24	6.795	0.600	26.450	26.200	0.250	27.2	300
5.000	PS1	PS3	10.999	0.600	26.885	26.631	0.254	43.3	150
5.001	PS3	PS4	6.050	0.600	26.631	26.580	0.051	118.6	225
5.002	PS4	PS24	23.407	0.600	26.580	26.200	0.380	61.6	300
1.009	PS24	PS25	4.801	0.600	26.200	26.150	0.050	96.0	300
1.010	PS25	PS26	4.809	0.600	26.150	26.100	0.050	96.2	300
1.011	PS26	PS27	26.052	0.600	26.100	25.800	0.300	86.8	300
1.012	PS27	PS28	6.034	0.600	25.800	25.600	0.200	30.2	300
1.013	PS28	PS29	25.331	0.600	25.600	25.400	0.200	126.7	300

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	Σ Area (ha)
4.001	1.338	23.6	11.4	0.058
4.002	1.031	18.2	17.1	0.087
4.003	1.996	79.4	22.8	0.116
4.004	2.653	105.5	22.8	0.116
1.007	1.472	104.0	43.0	0.219
1.008	3.027	214.0	43.0	0.219
5.000	1.533	27.1	25.2	0.128
5.001	1.199	47.7	25.2	0.128
5.002	2.006	141.8	25.2	0.128
1.009	1.604	113.4	68.2	0.347
1.010	1.603	113.3	68.2	0.347
1.011	1.688	119.3	68.2	0.347
1.012	2.872	203.0	68.2	0.347
1.013	1.395	98.6	68.2	0.347

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Detailed	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.840	Drain Down Time (mins)	240	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440	2160	2880	4320	5760	7200

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
30	0	0	0	100	45	0	0

Node PS28 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	1.013	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0067-2000-1000-2000
Invert Level (m)	25.600	Min Outlet Diameter (m)	0.100
Design Depth (m)	1.000	Min Node Diameter (mm)	1200
Design Flow (l/s)	2.0		

Node PS24 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	26.200
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	0

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)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	285.1	0.0	0.200	332.3	0.0	0.400	382.2	0.0	0.600	434.4	0.0	0.800	488.9	0.0	1.000	545.6	0.0
0.100	308.1	0.0	0.300	357.0	0.0	0.500	408.0	0.0	0.700	461.4	0.0	0.900	517.0	0.0			

Node PS27 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	25.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

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)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	181.0	0.0	0.200	218.1	0.0	0.400	257.8	0.0	0.600	299.7	0.0	0.800	343.9	0.0	1.000	390.4	0.0
0.100	199.1	0.0	0.300	237.6	0.0	0.500	278.4	0.0	0.700	321.5	0.0	0.900	366.9	0.0			

Node PS1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	16.000	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	26.900	Length (m)	70.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	7	Slope (1:X)	35.0		

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.69%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	PS17	10	29.317	0.013	0.4	0.0008	0.0000	OK
15 minute winter	PS18	11	29.054	0.014	0.4	0.0010	0.0000	OK
15 minute winter	PS7	10	29.407	0.047	6.2	0.0331	0.0000	OK
15 minute winter	PS8	10	28.881	0.087	12.7	0.0418	0.0000	OK
15 minute winter	PS15	10	29.345	0.049	6.2	0.0344	0.0000	OK
15 minute winter	PS16	10	28.844	0.074	12.3	0.0290	0.0000	OK
15 minute winter	PS9	10	28.473	0.089	30.7	0.0410	0.0000	OK
15 minute winter	PS10	10	27.771	0.139	36.7	0.0639	0.0000	OK
15 minute winter	PS11	11	27.432	0.122	36.5	0.0194	0.0000	OK
15 minute winter	PS12	11	27.025	0.174	36.9	0.0277	0.0000	OK
15 minute winter	PS19	13	29.556	0.156	10.5	0.8026	0.0000	SURCHARGED
15 minute winter	PS20	12	29.404	0.314	18.7	1.4854	0.0000	SURCHARGED
15 minute winter	PS21	12	29.344	0.354	23.5	0.2763	0.0000	SURCHARGED
15 minute winter	PS22	11	28.845	0.105	32.5	0.0689	0.0000	OK
15 minute winter	PS23	11	27.774	0.086	32.4	0.0136	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap
15 minute winter	PS17	1.000	PS18	0.4	0.614	0.033
15 minute winter	PS18	1.001	PS8	0.4	0.445	0.042
15 minute winter	PS7	2.000	PS8	6.1	1.768	0.403
15 minute winter	PS8	1.002	PS9	12.3	1.206	0.592
15 minute winter	PS15	3.000	PS16	6.1	1.679	0.433
15 minute winter	PS16	3.001	PS9	12.2	1.476	0.435
15 minute winter	PS9	1.003	PS10	30.5	1.515	0.333
15 minute winter	PS10	1.004	PS11	36.5	1.531	0.645
15 minute winter	PS11	1.005	PS12	36.9	1.363	0.567
15 minute winter	PS12	1.006	PS13	35.8	1.137	0.900
15 minute winter	PS19	4.000	PS20	8.8	1.331	0.857
15 minute winter	PS20	4.001	PS21	15.8	0.897	0.668
15 minute winter	PS21	4.002	PS22	22.9	1.378	1.257
15 minute winter	PS22	4.003	PS23	32.4	2.022	0.408
15 minute winter	PS23	4.004	PS13	32.4	2.188	0.307

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.69%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	PS13	11	26.738	0.178	67.7	0.2549	0.0000	OK
15 minute summer	PS14	10	26.590	0.140	65.6	0.0000	0.0000	OK
15 minute winter	PS1	12	27.283	0.398	46.3	3.2363	0.0000	SURCHARGED
15 minute winter	PS3	12	26.774	0.143	35.6	0.2051	0.0000	OK
15 minute winter	PS4	6	26.706	0.126	35.6	0.0000	0.0000	OK
30 minute winter	PS24	25	26.355	0.155	90.1	46.8555	0.0000	OK
360 minute winter	PS25	304	26.292	0.142	17.7	0.2038	0.0000	OK
360 minute winter	PS26	320	26.279	0.179	17.7	0.0000	0.0000	OK
360 minute winter	PS27	360	26.275	0.475	18.9	107.3225	0.0000	SURCHARGED
360 minute winter	PS28	360	26.275	0.675	9.8	0.9658	0.0000	SURCHARGED
15 minute summer	PS29	1	25.400	0.000	2.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap
15 minute winter	PS13	1.007	PS14	68.0	1.854	0.654
15 minute summer	PS14	1.008	PS24	66.2	3.074	0.309
15 minute winter	PS1	5.000	PS3	35.6	2.024	1.315
15 minute winter	PS3	5.001	PS4	35.6	1.588	0.747
15 minute winter	PS4	5.002	PS24	35.8	2.309	0.253
30 minute winter	PS24	1.009	PS25	42.8	1.245	0.378
360 minute winter	PS25	1.010	PS26	17.7	1.158	0.157
360 minute winter	PS26	1.011	PS27	17.7	0.938	0.149
360 minute winter	PS27	1.012	PS28	9.8	0.250	0.048
360 minute winter	PS28	Hydro-Brake®	PS29	2.0		

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.69%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	PS17	10	29.321	0.017	0.7	0.0011	0.0000	OK
15 minute winter	PS18	11	29.059	0.019	0.7	0.0013	0.0000	OK
15 minute winter	PS7	10	29.425	0.065	11.2	0.0455	0.0000	OK
15 minute winter	PS8	11	28.985	0.191	23.0	0.0920	0.0000	SURCHARGED
15 minute winter	PS15	10	29.369	0.073	11.2	0.0517	0.0000	OK
15 minute winter	PS16	10	28.881	0.111	22.3	0.0437	0.0000	OK
15 minute winter	PS9	11	28.526	0.142	54.2	0.0656	0.0000	OK
15 minute winter	PS10	12	28.186	0.554	64.8	0.2554	0.0000	SURCHARGED
15 minute winter	PS11	12	27.766	0.456	60.7	0.0724	0.0000	SURCHARGED
15 minute winter	PS12	12	27.315	0.464	58.8	0.0738	0.0000	SURCHARGED
15 minute winter	PS19	11	29.900	0.500	19.1	2.5800	1.8638	FLOOD
15 minute winter	PS20	12	29.855	0.765	25.2	3.6224	0.0000	FLOOD RISK
15 minute winter	PS21	12	29.766	0.776	33.4	0.6062	0.0000	FLOOD RISK
15 minute winter	PS22	11	28.878	0.138	49.8	0.0901	0.0000	OK
15 minute winter	PS23	11	27.796	0.108	49.7	0.0172	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap
15 minute winter	PS17	1.000	PS18	0.7	0.722	0.061
15 minute winter	PS18	1.001	PS8	0.7	0.471	0.078
15 minute winter	PS7	2.000	PS8	11.2	1.886	0.735
15 minute winter	PS8	1.002	PS9	21.8	1.292	1.047
15 minute winter	PS15	3.000	PS16	11.1	1.896	0.782
15 minute winter	PS16	3.001	PS9	22.1	1.668	0.787
15 minute winter	PS9	1.003	PS10	53.6	1.630	0.586
15 minute winter	PS10	1.004	PS11	60.7	1.600	1.072
15 minute winter	PS11	1.005	PS12	58.8	1.479	0.905
15 minute winter	PS12	1.006	PS13	58.1	1.464	1.462
15 minute winter	PS19	4.000	PS20	9.5	1.394	0.924
15 minute winter	PS20	4.001	PS21	20.4	1.156	0.861
15 minute winter	PS21	4.002	PS22	32.8	1.867	1.802
15 minute winter	PS22	4.003	PS23	49.7	2.244	0.626
15 minute winter	PS23	4.004	PS13	49.6	2.204	0.470

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.69%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	PS13	12	26.808	0.248	106.9	0.3544	0.0000	OK
15 minute winter	PS14	10	26.626	0.176	106.9	0.0000	0.0000	OK
15 minute winter	PS1	11	27.635	0.750	84.4	9.4269	3.5813	FLOOD
15 minute winter	PS3	12	26.802	0.171	44.8	0.2441	0.0000	OK
15 minute winter	PS4	5	26.790	0.210	44.8	0.0000	0.0000	OK
720 minute winter	PS24	705	26.497	0.297	20.3	94.9299	0.0000	OK
720 minute winter	PS25	705	26.497	0.347	18.2	0.4959	0.0000	SURCHARGED
720 minute winter	PS26	705	26.497	0.397	18.1	0.0000	0.0000	SURCHARGED
720 minute winter	PS27	705	26.496	0.696	17.8	173.0132	0.0000	SURCHARGED
720 minute winter	PS28	705	26.496	0.896	10.0	1.2826	0.0000	FLOOD RISK
15 minute summer	PS29	1	25.400	0.000	2.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap
15 minute winter	PS13	1.007	PS14	106.9	2.043	1.027
15 minute winter	PS14	1.008	PS24	107.1	3.264	0.501
15 minute winter	PS1	5.000	PS3	44.8	2.543	1.652
15 minute winter	PS3	5.001	PS4	44.8	1.688	0.939
15 minute winter	PS4	5.002	PS24	45.0	2.334	0.317
720 minute winter	PS24	1.009	PS25	18.2	1.016	0.160
720 minute winter	PS25	1.010	PS26	18.1	1.130	0.160
720 minute winter	PS26	1.011	PS27	17.8	0.925	0.149
720 minute winter	PS27	1.012	PS28	10.0	0.222	0.049
720 minute winter	PS28	Hydro-Brake®	PS29	2.0		

Civil Engineering - Transport Planning - Flood Risk

GTA Civils & Transport, Maple House, 192-198 London Road, Burgess Hill, West Sussex, RH15 9RD
T: 01444 871444 E: enquiries@gtacivils.co.uk www: gtacivils.co.uk
GTA Civils & Transport Limited, Registered in England No. 11917461. VAT Registration No. 319 2609 02